

Section III. OPERATION

3.1 INTRODUCTION

The TURFTS utilizes LABView to configure the test set for various operational modes. The screen is broken down into nine main areas of control

- (1) Main Screen
- (2) Transmitter Screen
- (3) Receiver Screen
- (4) Signal Monitors Screen
- (5) Spectrum Analyzer Screen
- (6) Strip Chart Screen
- (7) Inside TURFTS Screen
- (8) Fault Screen
- (9) Preference Screen

The following description will cover the operation for each of these screens.

3.2 TEST SET CONTROLS AND INDICATORS

3.2.1 MAIN SCREEN

The MAIN Screen is the first screen to initialize when TURFTS is loaded through the Windows Icon. The Main screen is always active. Refer to Figure 3.1 and Table 3.1. TURFTS loads in a default configuration file STM2 (Self Test Mode 2) upon initial turn on. This default configuration file can be change, however the name should remain the same since this is the file TURFTS looks for when first initialized.

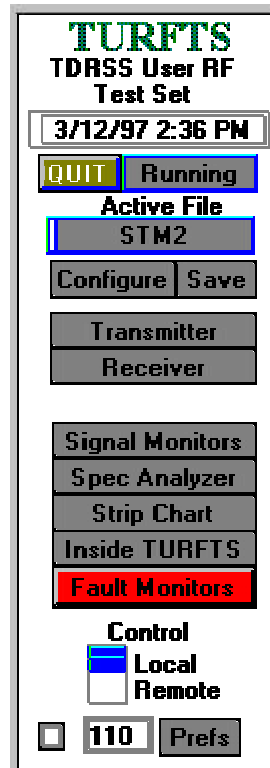


Figure 3.1. Main Screen

Table 3.1

Display or Button	Description
Date/Time	The computer's current date and time is displayed
QUIT	The QUIT button is clicked when the user wants to properly exit from the TURFTS program.
Status	Just to the right of the QUIT button is the status of TURFTS: Running or Idle.
Active File	This display shows the current configuration File TURFTS is running, such as STM2.
Configure	The user can click on this button to select a previously saved configuration file. This enables the user to quickly configure the test set to a desired setup without having to go through each screen. Before loading in a new configuration file the use should close all screens except the Main Screen.
Save	The user can click on this button if the current configuration of TURFTS needs to be saved for future use. The user will be prompted to enter a file name of eight characters or less. For example STM2 represents Self Test Mode 2.
Transmitter	Click on this button to activate the TURFTS Transmitter screen.
Receiver	Click on this button to activate the TURFTS Receiver screen
Signal Monitors	Click on this button to activate the TURFTS Signal Monitor screen.
Spec Analyzer	Click on this button to activate the TURFTS Spectrum Analyzer screen.
Strip Chart	Click on this button to activate the TURFTS Strip Chart Screen.
Inside TURFTS	Click on this button to activate the TURFTS access to subsystem screens.
Fault Monitors	Click on this button to activate the TURFTS Fault Monitor screen. The button will indicate Red if there is a TURFTS fault and will indicate green if no faults are detected.
Control	The user can configure the TURFTS to a remote control setting. If this is selected the user can not change any settings form the TURFTS controller. All control is either through a serial port or a network connection.
Cycle Time	Displays the time in milliseconds that the TURFTS controller takes to poll each subsystem. Typical readings are 100 to 110 milliseconds.
Prefs	Click on this button to turn on or off user unique TURFTS features

3.2.2 TRANSMITTER SCREEN

The TRANSMITTER Screen functions like a front panel control and enables the user to configure various functions of the TURFTS transmitter. Refer to Figure 3.2 and Table 3.2. The screen displays seven main areas of control and monitor:

- (1) Signal Parameters
- (2) Frequency Control and Status
- (3) Sweep Controls
- (4) Data Simulator Controls
- (5) Output Control and Status
- (6) Transponder Telemetry Output Controls
- (7) Antenna Switchbox

The screenshot displays the 'Transmitter' control interface with the following sections:

- Signal Parameters:** Includes 'R/L Mode 2' and 'TDRSS Parameters' (Agency: NASA, User Code: 1, I:Q Ratio: 1:1, I-PN/Q-PN: Enabled/Disabled).
- Frequency Control and Status:** Shows 'Frequency Select' (Indep of RX, RX * 221/240), 'Center Frequency' (2106.406250000 MHz), and 'Frequency Offset' (0.000 Hz).
- Sweep Controls:** Features 'Sweep Mode' (Reset, Off, Hold), 'Rate (Hz/sec)' (75), 'Range (Hz)' (750), and 'Sweep Status' (Off, Running).
- Data Simulator Controls:** Configures I-Ch and Q-Ch data rates (150.000 Kbps), patterns (2^11 - 1), simulation outputs (Data Simulator), encodings (Rate 1/2 G2 Inv), and formats (NRZ-M).
- Output Control and Status:** Monitors 'Sig Level' (10 dBm), 'Desired Xpndr Input' (10 dBm), 'Actual Xpndr Input' (NaN dBm), 'Ext Attenuation' (0 dB), and 'TURFTS Output' (10.0 dBm). It also includes 'RF Output Select' (Self Test) and 'TX Output' (On/Off).
- Antenna Switchbox:** Shows 'Select' (Omni Fore), 'Loss' (23), and an 'Antenna Switch' button.

Additional UI elements include a 'Quit/Close' button, a 'TX FAULT' indicator, and a 'SEND' button.

Figure 3.2 Transmitter Screen

Table 3.2

Display or Button	Description
Quit/Close	Click on this button to close the Transmitter screen and return to the previous active screen.
TX FAULT	If display is Red there is a transmitter-related fault. Activate the Fault Monitors screen from the MAIN Screen to isolate which fault has been detected.
TONS	The TDRS On-board Navigational System (TONS) button can be clicked if the user wants to transmit a doppler profile for a specific spacecraft orbit. This button can be deactivated from the Prefs Screen activated through the MAIN Screen.
SEND	The user clicks this button when the display under the button indicates yellow. This means there is a command in the buffer waiting to be executed.
Signal Parameters:	The user can click inside the box directly under the Signal Parameters and list all transmitter modes:
Forward Link	TDRS forward link mode normally used when transmitting to a Device Under Test (DUT)
R/L Mode 1	TDRS return link mode 1 normally used for testing the TURFTS receiver.
R/L Mode 2	TDRS return link mode 2 normally used for testing the TURFTS receiver.
R/L Mode 3	TDRS return link mode 3 normally used for testing the TURFTS receiver.
GN	Ground Network mode normally used when transmitting to a DUT.
BPSK	The Q Channel is deactivated and the I Channel is set to the R/L Mode 2 PN Codes.
TDRSS Parameters	When a TDRS transmitter function is selected the TDRSS Parameters box will be activated.
Agency	The user can click on the box under Agency and select one the following Space Agencies: NASA(USA), NASDA (Japan), or ESA.(European).
User Code (1-85)	The user can click in the box and enter a user code from 1 to 85.
I:Q Ratio	The user can select a ratio of 10:1 (Nominal forward link), 1:1, 1:2, or 1:4 (Nominal return links) by clicking in the box and selecting the desired ratio.
I-PN	The user can enable or disable the I PN code. The I channel remains enabled so any data on the I channel will remain on.
Q-PN	The user can enable or disable the Q PN code. The I channel remains enabled so any data on the Q channel will remain on.

Table 3.2, Continued

Display or Button	Description
GN Parameters	When the GN transmitter function is selected the GN Parameters box will be activated.
Test SC Freq	The user can click in the box and enter a test subcarrier frequency that can be phase modulated onto the carrier. This is normally used during self test operations.
Phase Mod Controls	
Test SC	The user can enable or disable the test subcarrier and set in the modulation index. This mode is normally used in the self test mode.
Carrier	The user can enable or disable the carrier baseband data and set in the modulation index. This mode is normally used in the self test mode.
User Cmd	Provides control for the user supplied telemetry to the transmitted carrier. The user can select either baseband mode or subcarrier mode. The modulation index is controlled by the level of the user supplied telemetry.
Frequency Control and Status	
Frequency Select	The user can configure the transmitter to be independent of the receiver or dependent to the receiver by the turn around ratio of 221/240.
Center Frequency	Click inside the box and enter the desired transmit frequency in MHz. The displayed frequency is the actual frequency being transmitted.
Frequency Offset	Click inside the box and enter an offset frequency in Hz. The displayed offset frequency is the actual offset from the actual displayed center frequency.
Sweep Controls	
Reset	Clicking on the Reset button will immediately return the transmitter center frequency to zero.
Sweep Mode	Click inside the box and select the desired sweep mode. The user can perform a continuous linear sweep, a one way sweep, or return to center frequency at the selected sweep rate.
Rate (Hz/sec)	Click inside the box enter the desired sweep rate in Hz/sec. If the value is positive the carrier will start its sweep in the positive direction and if the value is negative the carrier will start its sweep in the negative direction.
Range (Hz)	Click inside the box and enter the desired sweep range. If 100 Hz is entered the range will be +/- 100 Hz.
Sweep Status	Displays the type of sweep selected and whether the carrier is sweeping or stopped.

Table 3.2, Continued

Display or Button	Description
Data Simulator Controls	
I-Ch Data Rate (Kbps)	Click inside the box and enter a data rate from 0.1 to 2500 Kbps. In the TDRS mode the data is exclusive or'd onto the PN code. In the GN mode the data is PSK onto the test subcarrier.
Q-Ch Data Rate (Kbps)	Click inside the box and enter a data rate from 0.1 to 2500 Kbps. In the TDRS mode the data is exclusive or'd onto the PN code. In the GN mode the data is PM onto the carrier.
I-Ch Data Pattern	Click inside the box and select from the provided patterns of 2 ³ -1, 2 ⁷ -1, 2 ¹¹ -1, 2 ¹⁵ -1, 2 ²⁰ -1, or 2 ²³ -1.
Q-Ch Data Pattern	Click inside the box and select from the provided patterns of 2 ³ -1, 2 ⁷ -1, 2 ¹¹ -1, 2 ¹⁵ -1, 2 ²⁰ -1, or 2 ²³ -1.
I-Ch Data Sim Output	Click inside the box and select from the provided options: OFF (disables the I data), Ext. User Input (Selects the User TDRS CMD input when the transmitter is in the TDRS mode only) or Data Simulator.
Q-Ch Data Sim Output	Click inside the box and select from the provided options: OFF (disables the Q data), I-Ch Output (Selects what is being used for the I Channel) or Data Simulator.
I-Ch Data Encoding	Click inside the box and select from the provided options: None (Viterbi encoding disabled), Rate 1/2 G2 Norm or Rate 1/2 G2 Inv.
Q-Ch Data Encoding	Click inside the box and select from the provided options: None (Viterbi encoding disabled), Rate 1/2 G2 Norm, Rate 1/2 G2 Inv or Rate 1/3.
I-Ch Data Format	Click inside the box and select from the provided options: NRZ-L, NRZ-M, NRZ-S, Bi0-L, Bi0-M, Bi0-S or Diff. Manch.
Q-Ch Data Format	Click inside the box and select from the provided options: NRZ-L, NRZ-M, NRZ-S, Bi0-L, Bi0-M, Bi0-S, Diff. Manch, NRZ-L Interleaved, NRZ-M Interleaved, or NRZ-S Interleaved.
Transponder TLM Output Controls	These are used to provide an external simulated data source to modulate on the DUT transmitted output.
I-Ch TLM Output	Selects the data specified for the I channel in the Data Simulator Control Panel. The Data Sim Output needs to be set to Data Simulator. The data is available from the Data Simulator Module front panel.
Q-Ch TLM Output	Selects the data specified for the Q channel in the Data Simulator Control Panel. The Data Sim Output needs to be set to Data Simulator. The data is available from the Data Simulator Module front panel.

Table 3.2, Continued

Display or Button	Description
Output Control and Status	
Desired Xpndr Input	Click inside the box and enter the desired transmit level in dBm at the DUT.
Actual Xpndr Input	Displays the actual level at the DUT based on calibrated attenuator settings and attenuation external to the test set.
Ext Attenuation	Click inside the box and enter the attenuation and/or cable loss from the test set to the DUT.
TURFTS Output	Displays the output level of the test set.
RF Output Select	Click inside the box and select from the provided options: Self Test (Configures the test set to translate the transmitter frequency to the receiver frequency), Diplexed Output (Configures the test set to transmit and receive through one RF cable) or Non-diplexed Output (Configures the test set to transmit on one RF cable and receive on another RF cable).
TX Output	Click on the switch to enable or disable the transmitter.
Antenna Switchbox Select	This feature is activated or deactivated through the Pref button located on the MAIN Screen. Click on the inside of the box and select from the provided settings:HGA-RHC(High Gain Antenna Right Hand Circular), HGA-LHC (High Gain Antenna Left Hand Circular), Omni-Fore, Omni-Aft, Test Port 1, or Test Port 2.
Loss	While any one of the above selections is activated a cable loss can be entered and set for that specific path.
Antenna Switch	Click on the button to activate the Antenna Switchbox screen. From this screen the losses can be entered for all selected ports.

3.2.3 RECEIVER SCREEN

The RECEIVER Screen functions like a front panel control and enables the user to configure various functions of the TURFTS receiver. Refer to Figure 3.3 and Table 3.3. The screen displays five main areas of control and monitor:

- (1) Signal Parameters
- (2) Receiver Status
- (3) Receiver Configuration
- (4) Phasing
- (5) Time Interval Counter

The Receiver screen is divided into several functional areas:

- Signal Parameters:** Includes R/L Mode 2, TDRSS Parameters (Agency: NASA, User Code: 1, I:Q Ratio: 1:1, I-PN/Q-PN: Enabled/Disabled, Track I, C/No Range: Medium), Auto/Manual I Phasing (3.0/3.8), I Phasing/Q Phasing (3.0/3.8), Bit-Sync Xtras, and Time Interval Counter (OFF/ABS, Mean: 0.0 ns, Std Dev: 0.0 ns, Offset: 0.0 ns).
- Receiver Status:** Shows Receiver State (Initialization), PN Loop Lock, Carrier Loop Lock, Subcar Loop Lock, Phase Error (Deg) and SC Phase Error (Deg) meters, RF Source (Self Test), RX Config (F/L), PN Codes (I/Q), Track I, RX Center (2110.000000 MHz, NC), RX Offset (77500000 Hz), Subcar Freq (0.000000 MHz), RX Chip Rate (0.000000 Mcps, NC), Chip Rate Offset (799.48 Chips), RF Signal Level (-31.0 dBm), IF Level Low warning, I-Ch and Q-Ch parameters (Bit Sync Lock, Decoder Lock, Eb/No, LPF BW), and Carrier Loop BW (30 Hz).
- Receiver Configuration:** Includes Center Freq (MHz) (2287.500000), Offset Freq (Hz) (0), RXAttn (30), AGC (OFF), PN Reacq, Carrier Loop BW, Acq Loop BW, Trk Loop BW, Resets (I-Ch B-S, Q-Ch B-S, I-Ch Dec, Q-Ch Dec), RT/Diag (Disable), Squelch (Disable), Car Reacq, and Bit-Sync/Decoder Controls (I-Ch and Q-Ch Data Rate, Bit-Sync Loop BW, Data Encoding, Data Format, Data Polarity).
- SEND:** A green button located at the bottom right of the screen.

Figure 3.3 Receiver Screen

Table 3.3

Display or Button	Description
Quit/Close	Click on this button to deactivate the Transmitter screen and return to the previous active screen.
RX FAULT	If display is Red there is a receiver related fault. Activate the Fault Monitors screen from the MAIN Screen to isolate which fault has been detected.
Bit-Sync Xtras	Clicking on this button activates a screen for enabling or disabling I and Q data channel Bit Sync controls. When the telemetry data is in a Bi0 format the user can bypass the Bi0 to NRZ-L conversion for either or both channels. The user can also select one or both of the Bit Syncs for external data inputs at the rear panel interface J11 and J12.
SEND	The user clicks this button when the display under the button indicates yellow. This means there is a command in the buffer waiting to be executed.
Signal Parameters:	The user can click inside the box directly under the Signal Parameters and list all receiver modes:
Forward Link	TDRS forward link mode normally used for testing the TURFTS transmitter
R/L Mode 1	TDRS return link mode 1 normally used for testing the DUT.
R/L Mode 2	TDRS return link mode 2 normally used for testing the DUT.
R/L Mode 3	TDRS return link mode 3 normally used for testing the DUT.
GN	Ground Network mode.
TDRSS Parameters	When a TDRS receiver function is selected the TDRSS Parameters box will be activated.
Agency	The user can click on the box under Agency and select one the following Space Agencies: NASA(USA), NASDA(Japan), or ESA.(European).
User Code (1-85)	The user can click in the box and enter a user code from 1 to 85.
I:Q Ratio	The user can select a ratio of 10:1 (Nominal forward link), 1:1, 1:2, or 1:4 (Nominal return links) by clicking in the box and selecting the desired ratio.
I-PN	The user can enable or disable the I PN code.
Q-PN	The user can enable or disable the Q PN code.
Tracking	Click inside the box to select either Track I (PN acquisition and track on the I Channel) or Track Q (PN acquisition and track on the Q Channel).
C/No Range	Click inside the box to select the range of signal level being received: Low (-110 to -90 dBm), Medium (-90 to -50 dBm), or High (-50 to -10 dBm).
GN Parameters	When a GN receiver function is selected the GN Parameters box will be activated.
Subcarrier Freq	Click inside the box and enter the subcarrier frequency in KHz.
Mod Index	Click inside the box and enter the modulation index of the received subcarrier.

Table 3.3, Continued

Display or Button	Description
Receiver Status	
Receiver State	Displays the current receiver activity such as PN Code Acquisition and Tracking.
RF Source	Displays the RF source being received such as Self Test or Diplexed.
PN Loop Lock	In the TDRS mode will illuminate green when the PN loop is locked. In the GN mode will be deactivated.
Phase Error (Deg)	Displays the estimated carrier phase error in degrees.
RX Config	Displays the receiver's configuration such as R/L Mode 2 or GN.
Carrier Loop Lock	Will illuminate green when the carrier loop is locked.
PN Codes	In the TDRS mode indicates whether the codes are enabled (green) or disabled (red). In the GN mode the indicators are deactivated.
Subcar Loop Lock	In the GN mode will illuminate green when the subcarrier is locked. This indicator is deactivated in the TDRS mode.
Track	In the TDRS mode indicates which channel is being tracked either I or Q. This indicator is deactivated in the GN mode.
SC Phase Error (Deg)	In the GN mode displays the estimated subcarrier phase error in degrees. This function is deactivated in the TDRS mode.
RX Center	Displays the receiver's center frequency. When the carrier is locked the display indicates the frequency being received.
RX Offset	Displays the difference between the receiver's center frequency and the frequency being tracked.
Subcar Freq	In the GN mode displays the receiver's subcarrier frequency. When the subcarrier receiver is locked displays the frequency being received. This function is deactivated in the TDRS mode.
RX Chip Rate	Displays the receiver's PN code clock frequency. When the PN loop is locked displays the received PN code clock frequency. This function is deactivated in the GN mode.
Chip Rate Offset	Displays the difference between the receiver's code clock and the code clock being received. This function is deactivated in the GN mode.
RX Signal Level	Displays the received signal level referenced to the S-band input.
I Bit Sync Lock	Illuminates green when the I channel bit sync is locked.
Q Bit Sync Lock	Illuminates green when the Q channel bit sync is locked.
I Decoder Lock	Illuminates green when the I channel decoder is locked.
Q Decoder Lock	Illuminates green when the Q channel decoder is locked.
I Eb/No	Displays estimated data signal to noise density if Viterbi encoding is used.
Q Eb/No	Displays estimated data signal to noise density if Viterbi encoding is used.
I LPF BW	Displays the data bandwidth. Automatically selected based on symbol rate.
Q LPF BW	Displays the data bandwidth. Automatically selected based on symbol rate.
Carrier Loop BW	Displays the current carrier loop bandwidth.

Table 3.3, Continued

Display or Button	Description
Receiver Configuration	
Center Frequency (MHz)	Click inside the box to enter the receiver's center frequency.
Ind/Dep	Click on switch to select whether the receiver center frequency is independent of the transmitter center frequency or dependent by the ratio 240/221.
Offset Freq (Hz)	Click inside the box to enter a frequency offset.
RXAttn	Click inside the box to select a receiver attenuation from 0 to 70 dB.
AGC	Click on the button to enable or disable the receiver AGC.
Acq Loop BW	Click inside the box to select from the available options: Auto, 30 Hz, 70 Hz, 500 Hz, or 1000 Hz.
Trk Loop BW	Click inside the box to select from the available options: Auto, 30 Hz, 70 Hz, 500 Hz, or 1000 Hz.
I-Ch B-S Reset	Click on button to reset the I Channel Bit-Sync
Q-Ch B-S Reset	Click on button to reset the Q Channel Bit-Sync
I-Ch Dec Reset	Click on button to reset the I Channel Decoder
Q-Ch Dec Reset	Click on button to reset the Q Channel Decoder
RT/Diag	Click on the RT/Diag button to enable/disable the external inputs to the Bit-Syncs. Real Time is for the I Channel and Diagnostic is for the Q Channel Bit-Sync.
Squelch	Click on the Squelch button to enable/disable the Bit-Sync squelch.
PN Reacq	Click on the PN Reacquisition button to reinitialize the PN acquisition sequence.
Car Reacq	Click on the Carrier Reacquisition button to reinitialize the carrier acquisition sequence.
Bit-Sync/Decoder Controls	
I-Ch Data Rate (Kbps)	Click inside the box to enter the received I Channel data rate in Kbps.
Q-Ch Data Rate (Kbps)	Click inside the box to enter the received Q Channel data rate in Kbps.
I-Ch Bit-Sync Loop BW	Click inside the box to enter the I Channel Bit-Sync Loop BW, typically 1%.
Q-Ch Bit-Sync Loop BW	Click inside the box to enter the Q Channel Bit-Sync Loop BW, typically 1%.
I-Ch Data Encoding	Click inside the box to select from the available coding formats: None, 1/2 G2 Norm, or 1/2 G2 Inv.
Q-Ch Data Encoding	Click inside the box to select from the available coding formats: None, 1/2 G2 Norm, 1/2 G2 Inv, or 1/3.
I-Ch Data Format	Click inside the box to select from the available data formats: NRZ-L, NRZ-M, NRZ-S, Bi0-L, Bi0-M, or Bi0-S.
Q-Ch Data Format	Click inside the box to select from the available data formats: NRZ-L, NRZ-M, NRZ-S, Bi0-L, Bi0-M, Bi0-S, NRZ-L Intlvd, NRZ-M Intlvd, or NRZ-S Intlvd.
I-Ch Data Polarity	Click on the Polarity button to set the Bit-Sync output data and clock in phase (Normal) or data inverted.
Q-Ch Data Polarity	Click on the Polarity button to set the Bit-Sync output data and clock in phase (Normal) or data inverted.

Table 3.3, Continued

Display or Button	Description
Time Interval Counter	When activated through the Pref screen, accessed from the MAIN Screen, the user has the option to normalize the DUT range data in the TDRS mode.
OFF	Click on the button to turn the remote function ON or OFF.
ABS	Click on the button to display readings as Absolute or Relative.
Mean	Displays the Mean time interval reading.
Std Dev	Displays the standard deviation.
Offset	Click inside the box to enter any normalization number such that the Mean being displayed will be the two-way delay of the DUT. This is the value that will be recorded if the Strip Chart Log is activated.

3.2.4 SIGNAL MONITORS SCREEN

The Signal Monitors Screen functions like a front panel control and enables the user to select a monitor point for the spectrum analyzer or the digital oscilloscope. Refer to Figure 3.4 and Tables 3.4A and 3.4B. The screen displays two main areas of control; (1) Spectrum Analyzer and (2) Digital Oscilloscope.

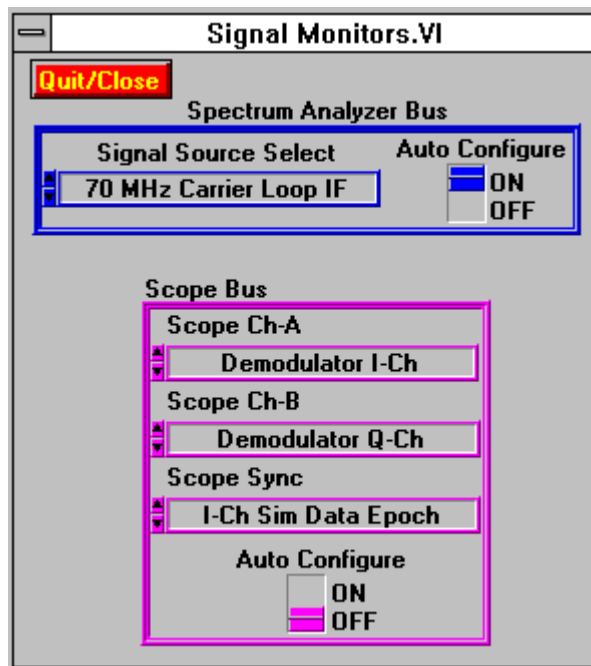


Figure 3.4 Monitor Screen

Table 3.4A

Display or Button	Description
Quit/Close	Click on this button to deactivate the Signal Monitors screen and return to the previous active screen.
Spectrum Analyzer Bus	
Signal Source Select	Click inside the box to select available spectrum monitor points: Forward Link Sample, Return Link Sample, RF Distribution 370 MHz, 370 MHz IF, 70 MHz Carrier Loop IF, 70 MHz PN Loop IF, Demod I-Channel 70 MHz IF, Demod Q-Channel 70 MHz IF.
Auto Configure	Click the switch to ON to automatically configure the spectrum analyzer to preset saved conditions.
Scope Bus	
Scope Ch-A	Click inside the box to select from a list of scope monitor points. See table 3.4B.
Scope Ch-B	Click inside the box to select from a list of scope monitor points. See table 3.4B.
Scope Sync	Click inside the box to select from a list of scope monitor points. See table 3.4B.
Auto Configure	For Future development

Table 3.4B

Scope Ch-A	Description
Demodulator I-Ch	Displays the filtered data output from the Data Demodulator Module prior to going to the Bit-Sync Module.
DSP EL-Q	Displays the Quadrature PN track baseband from the 370 MHz IF Tracking module to the Digital Signal Processor Module.
DSP OT-I	Displays the Inphase Carrier track baseband from the 370 MHz IF Tracking module to the Digital Signal Processor Module.
PM Combiner	Displays the combined GN modulation that is sent to the Phase Modulator in the RFDU.
Subcarrier RX Q-Ch	Displays the subcarrier quadrature error volts that goes to the Digital Signal Processor Module.
TX I-PN Code	Displays the I-PN Code (and Data if enabled) from the Transmitter Synthesizer Module A3 to the RFDU QPSK Modulator Module A1.
TX Q-PN Code	Displays the Q-PN Code (and Data if enabled) from the Transmitter Synthesizer Module A3 to the RFDU QPSK Modulator Module A1.
TX PN Code Clock	Displays the PN Clock from the Transmitter PN Code Chip.
TX Long Code Epoch	Displays the TX PN Long Code Epoch
TX Short Code Epoch	Displays the PN Clock from the Transmitter PN Code Chip.
TX PNG x4 Clock	Displays the TX PN clock that drives the TX PN Code Generator Chip.
I-Ch Decoder Data	Displays the I channel Viterbi Decoder Data output.
I-Ch Decoder Clock	Displays the I channel Viterbi Decoder Clock output.
I-Ch Bit Sync Data	Displays the output data of the I Channel Bit-sync.
I-Ch Bit Sync Clock	Displays the output clock of the I Channel Bit-sync.
F/L User Commands	Displays the User's Forward Link TDRS commands.
I-Ch Sim Symbols	Displays the I Channel encoded data from the converter chip.
Q-Ch Sim Symbols	Displays the Q Channel encoded data from the converter chip.
I-Ch Sim Data Clock	Displays the I Channel G1 Clock from the data converter chip.
Q-Ch BiPhase Data	Displays the Q Channel BiPhase data from the data converter chip.

Table 3.4B, Continued

Scope Ch-B	Description
Demodulator Q-Ch	Displays the filtered data output from the Data Demodulator Module prior to going to the Bit-Sync Module.
DSP EL-I	Displays the Inphase PN track baseband from the 370 MHz IF Tracking module to the Digital Signal Processor Module.
DSP OT-Q	Displays the Quadrature Carrier track baseband from the 370 MHz IF Tracking module to the Digital Signal Processor Module.
Subcarrier RX I-Ch	Displays the subcarrier Inphase error volts from the GN Module to the Digital Signal Processor Module.
RX I-PN Code	Displays the I PN code generated by the Receiver PN Code chip in the A4 Module
RX Q-PN Code	Displays the Q PN code generated by the Receiver PN Code chip in the A4 Module
RX SPN Code	Displays the SPN code used in the carrier tracking loop generated by the Receiver PN Code chip in the A4 Module
RX TKPN Code	Displays the TKPN code used in the PN tracking loop generated by the Receiver PN Code chip in the A4 Module
RX Short Code Epoch	Displays the receiver's short code (Mode 2) epoch.
RX Long Code Epoch	Displays the receiver's long code (Modes 1 & 3, F/L) epoch used for ranging.
Sync Complete	Indicates completion of the receiver's tracking code synched to the incoming code.
Dither Clock	Displays the clock used by the digital signal processor to
Q-Ch Decoder Data	Displays the Q channel Viterbi Decoder Data output.
Q-Ch Decoder Clock	Displays the Q channel Viterbi Decoder Clock output.
Q-Ch Bit Sync Data	Displays the output data of the Q Channel Bit-sync.
Q-Ch Bit Sync Clock	Displays the output clock of the Q Channel Bit-sync.
I-Ch Sim Data	Displays the Data Simulator's I data pattern prior to any format conversion or encoding.
Q-Ch Sim Data	Displays the Data Simulator's Q data pattern prior to any format conversion or encoding.
Q-Ch Sim Data Clock	Displays the Q Channel G1 Clock from the data converter chip.
TX PN Code Clock	The PN Clock from the Transmitter PN Code Chip.
TX Long Code Epoch	The transmitter's long code (Modes 1 & 3, F/L) epoch.
TX Short Code Epoch	The transmitter's short code (Mode 2) epoch.
RX Short Code Epoch	The receiver's short code (Mode 2) epoch.
RX Long Code Epoch	The receiver's long code (Modes 1 & 3, F/L) epoch.
Dither Clock	The clock used by the digital signal processor to
I-Ch Sim Data Epoch	The I data epoch from the Data Simulator's data pattern chip.
Q-Ch Sim Data Epoch	The Q data epoch from the Data Simulator's data pattern chip.
I-Ch Sim Data Clock	The I Channel G1 Clock from the data converter chip.
Q-Ch Sim Data Clock	The Q Channel G1 Clock from the data converter chip.

3.2.5 SPECTRUM ANALYZER SCREEN

The Spectrum Analyzer Screen functions like a front panel control and enables the user to control the spectrum analyzer from the computer screen. Most of the functions of the analyzer are provided for the user to enter without having to configure the analyzer from its control panel. This function can be enabled or disabled from the preference list. Refer to Figure 3.5.

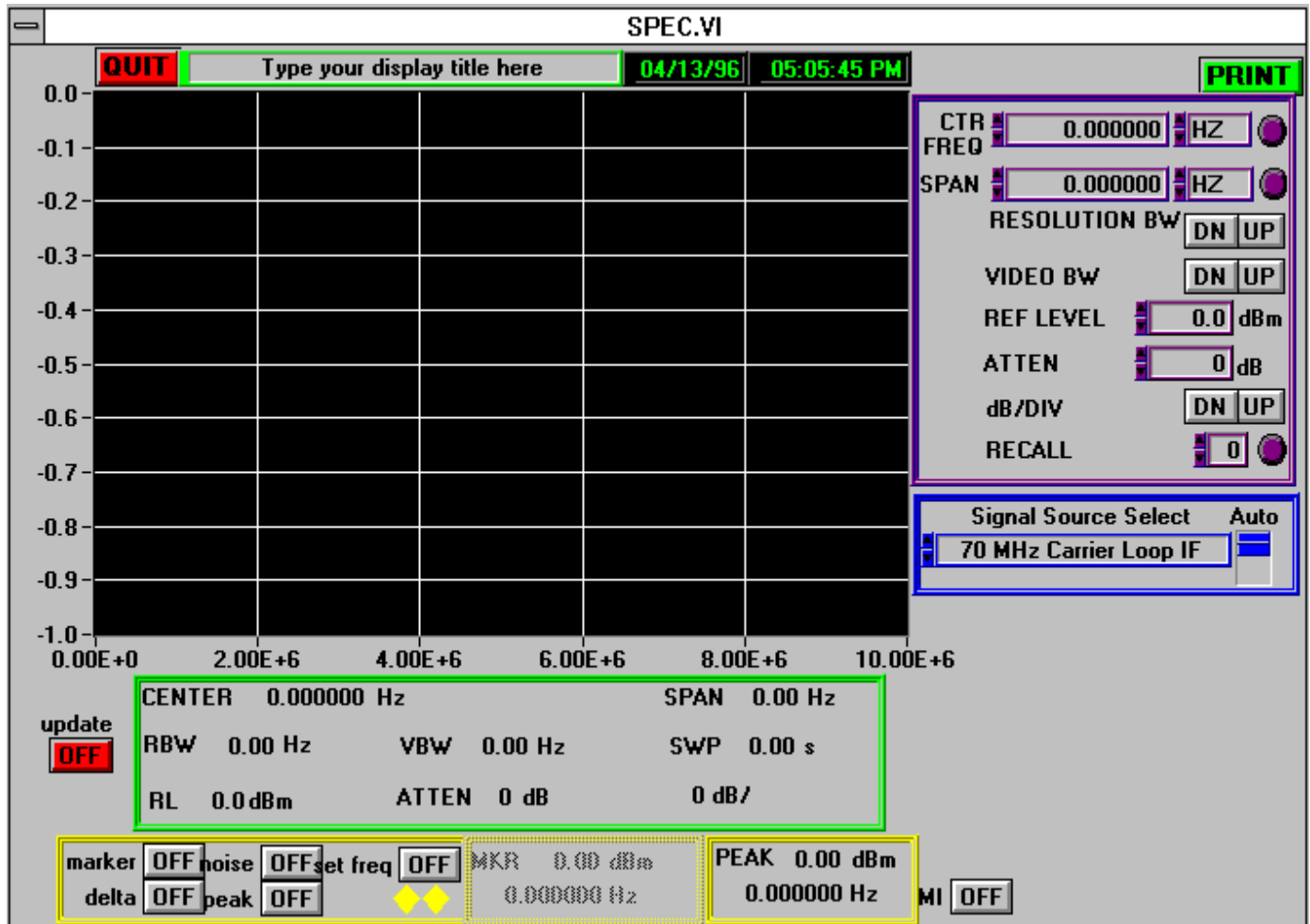


Figure 3.5 Spectrum Analyzer Screen

Table 3.5

Monitor Selection	Description
QUIT	Click on this button to deactivate the screen and return to the previous active screen.
CTR FREQ	Enter the desired center frequency in units designated.
SPAN	Enter the desired span in units designated.
RESOLUTION BW	Increment up or down as desired.
VIDEO BW	Increment up or down as desired.
REF LEVEL	Sets the spectrum analyzer's amplitude reference level
ATTEN	Sets the spectrum analyzer's attenuation level.
DB/DIV	Sets the spectrum analyzer's dB/div unit.
RECALL	Will recall a previously saved spectrum analyzer configuration. Configurations 1 through 4 are reserved for TURFTS monitor points.
Signal Source Select	The user can activate and select one of the spectrum analyzer monitor points
Display Title	The user can type in a descriptive title for the spectrum being displayed.
update	When activated the Spectrum analyzer screen will be updated on the computer screen
Marker Controls	The user can control where the marker is and which marker is used from the computer screen.
PRINT	If a printer is connected the screen will be printed.

3.2.6 STRIP CHART SCREEN

The Strip Chart Screen functions like a front panel control and enables the user to select three monitor points for strip charting and saving to a text file for off line processing.

The user can specify the time interval between measurements. Refer to Figure 3.6 and Table 3.6.

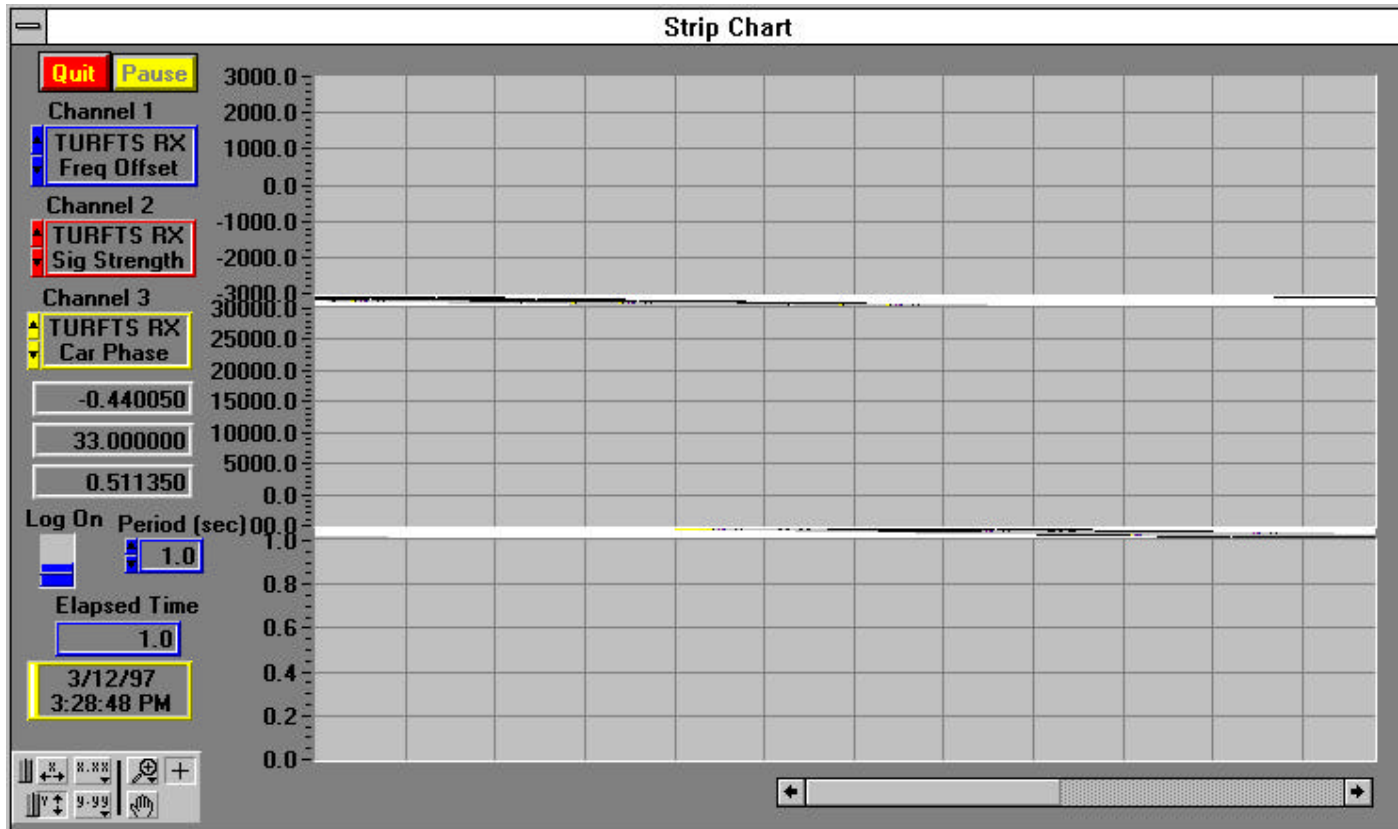


Figure 3.6 Strip Chart Screen

Table 3.6

Monitor Selection	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.
TURFTS TX Center Freq	Displays the Transmitter's Center Frequency.
TURFTS TX Freq Offset	Displays the Transmitter's Offset from Center Frequency.
TURFTS RX Center Freq	Displays the Receiver's Center Frequency.
TURFTS RX Freq Offset	Displays the Receiver's Offset from the specified Center Frequency.
TURFTS RX Sig Strength	Displays the received signal strength referenced to the S-band input.
TURFTS RX Est. C/No	Displays the estimated C/No based on the received signal strength and the receiver's noise figure.
TURFTS RX PN Code Lock	Displays the correlation voltage from the Receiver's PN tracking loop.
TURFTS RX Carrier Lock	Displays the lock status of the carrier tracking loop.
TURFTS RX Car Phase Err	Displays the estimated phase noise from the carrier tracking loop in degrees peak.
TURFTS RX Subcar Lock	Displays the lock status of the subcarrier tracking loop.
TURFTS RX SC Phase Er	Displays the estimated phase noise from the subcarrier tracking loop in degrees peak.
TURFTS RX SC Freq.	Displays the Receiver's subcarrier frequency.
TURFTS RX I Bit Sync Lock	Displays the lock status of the I channel bit sync.
TURFTS I Eb/No	Displays the estimated I channel data Eb/No if the data is encoded.
TURFTS RX Q Bit Sync Lock	Displays the lock status of the Q channel bit sync.
TURFTS RX Q Eb/No	Displays the estimated Q channel data Eb/No if the data is encoded.
TURFTS RX Chip Rate	Displays the receiver's PN code chip rate in Hz.
TURFTS RX PN Offset	Displays the receiver's PN code chip rate offset from the specified rate.
TURFTS TIC Mean	Displays the time interval counter's mean measurement during PN code ranging.
TURFTS TIC Std Dev	Displays the standard deviation from the mean measurement of the time interval counter.

3.2.7 INSIDE TURFTS SCREEN

The Inside TURFTS Screen functions like a front panel control and enables the user to monitor the status of the TURFTS subsystems. There are also calibration functions located in this screen. Refer to Figure 3.7A and Table 3.7A.

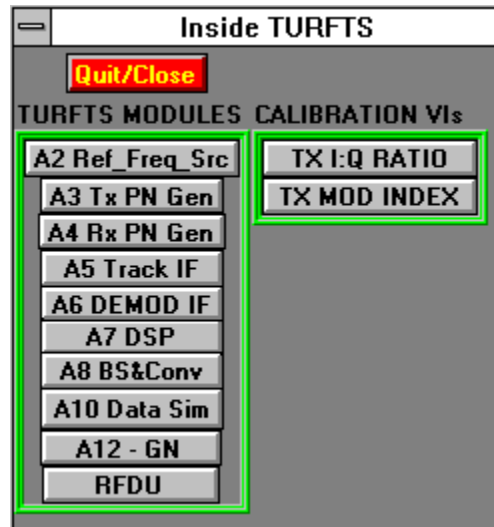


Figure 3.7A Inside TURFTS Screen

Table 3.7A

Selection	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.
A2 Ref_Freq Src	Displays the status of the Reference Frequency Module. Refer to Fig. 3.7B and Table 3.7B.
A3 Tx PN Gen	Displays the status and control of the Transmitter Frequency Synthesizer Module A3. Refer to Fig. 3.7C and Table 3.7C.
A4 Rx PN Gen	Displays the status and control of the Receiver Frequency Synthesizer Module A4. Refer to Fig. 3.7D and Table 3.7D.
A5 Track IF	Displays the status and control of the Receiver IF Tracking Module A5. Refer to Fig. 3.7E and Table 3.7E.
A6 DEMOD IF	Displays the status and control of the Receiver Demodulator Module A6. Refer to Fig. 3.7F and Table 3.7F.
A7 DSP	Displays the status and control of the Digital Signal Processor Module A7. Refer to Fig. 3.7G and Table 3.7G.
A8 BS&Conv	Displays the status and control of the Bit Sync and Viterbi Decoder Module A8. Refer to Fig. 3.7H and Table 3.7H.
A10 Data Sim	Displays the status and control of the Data Simulator Module A10. Refer to Fig. 3.7I and Table 3.7I.
A12 - GN	Displays the status and control of the Ground Network Module A12. Refer to Fig. 3.7J and Table 3.7J.
RFDU	Displays the status and control of the RF Distribution Unit. Refer to Fig. 3.7K and Table 3.7K.
TX I:Q RATIO	Provides the user access to recalibrating the transmitter's I/Q ratios. Refer to Fig. 3.7L and Table 3.7L.
TX MOD INDEX	Displays the controls for calibrating the GN mode modulation index for the internal test modulation and user provided modulation.

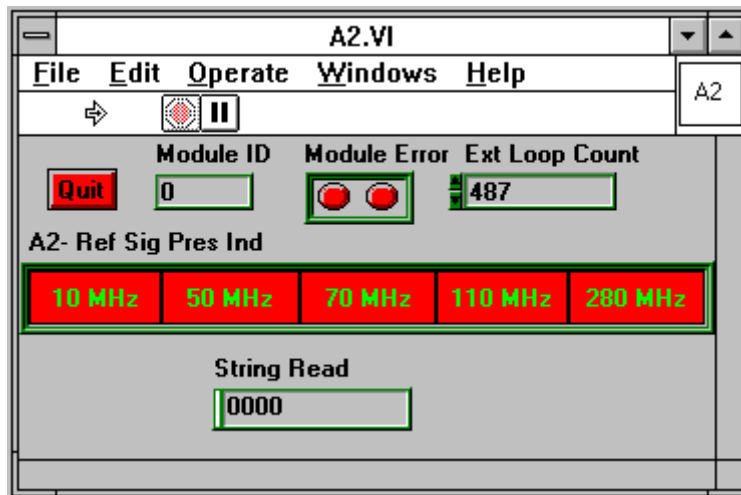


Figure 3.7B Reference Frequency Screen

Table 3.7B

Control/Display	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.
Module ID	Displays the module's ID
Module Error	Indicates an error within the module that is reported to the higher level screens.
Ext Loop Count	Displays in milliseconds the time TBD
10 MHz	Displays presence of reference signal
50 MHz	Displays presence of reference signal
70 MHz	Displays presence of reference signal
110 MHz	Displays presence of reference signal
280 MHz	Displays presence of reference signal
String Read	Displays

A3.VI

File Edit Operate Windows Help

Quit Override Ext. Count 989

PN Gen Configuration

Agency NASA

User Code (1-85) 1

TDRSS Mode R/L Mode 2

I-PN Q-PN

Enabled Disabled

I-DATA Q-DATA

Enabled Disabled

SPN TKPN

Q I

Dismiss Step Size 1023 Chips

TX Sync

Enabled Disabled

Init_PNG

CLRACQ

SACQ

PN_STEP

Center Frequency 2106.406250000 MHz

Frequency Offset 0.000 Hz

NCO Freq 13.90625000000

48 Bit Control Word 4733 3333 3333

Sweep Controls

Reset Sweep Mode Off Rate (Hz/sec) 75 Range (Hz) 750

Monitor Bus

Scope Sync Select TX Short Code Epoch

Scope Ch-A Select TX I-PN Code

Scope Sync Disable Scope Ch-A Disable

A3 Synth Status

Current Freq 0.000000000

Current Offset 0.000

Waiting for Sync

Sweep Mode Off

Sweep Hold Run

RTZ Finished

Elapsed Time 0.00000

NCO Freq 249.99999994

STATUS IN

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

0000 0000 0000 0000

status bytes

Current Freq (47...16) 0

Current Freq (15...0) 0

Counter 0

Table Index 0

A3-Status

TX MKR LOCK TX LO SP XL Lock XL LO SP PNC Lock Fault

Module Error

Figure 3.7C Transmitter Frequency Synthesizer Screen

Table 3.7C

Control/Display	Description
Quit Override EXT.Count PN Gen Configuration Agency User Code (1-85) TDRSS Mode I-PN Q-PN I-DATA Q-DATA SPN TKPN Dismiss Step Size TX Sync Init_PNG CLRACQ SACQ PN STEP Center Frequency NCO Freq Frequency Offset 48 Bit Control Word Sweep Controls Reset Sweep Mode Hold Rate (Hz/sec) Range (Hz) Monitor Bus Scope Sync Select Scope Ch-A Scope Sync Control Scope Ch-A Control A3 Synth Status Current Freq Current Offset Waiting for Sync Sweep Mode Sweep Hold RTZ Elapsed Time NCO Freq STATUS IN	Click on this button to deactivate the screen and return to the previous active screen.

Table 3.7C, Continued

Control/Display	Description
status bytes Current Freq (47...16) Current Freq (15...0) Counter Table Index A3-Status TX MXR LOCK TX LO SP XL Lock PNC Lock Fault Module Error	



Figure 3.7D Receiver Frequency Synthesizer Screen

Table 3.7D

Control/Display	Description
Quit Override EXT Loop Count Monitor Bus Scope Sync Select Scope Ch B Select Scope Sync Control Scope Ch-B Control String In Monitor Bus Bytes RX MXR CAR LP LO RX LO FAULT	Click on this button to deactivate the screen and return to the previous active screen.

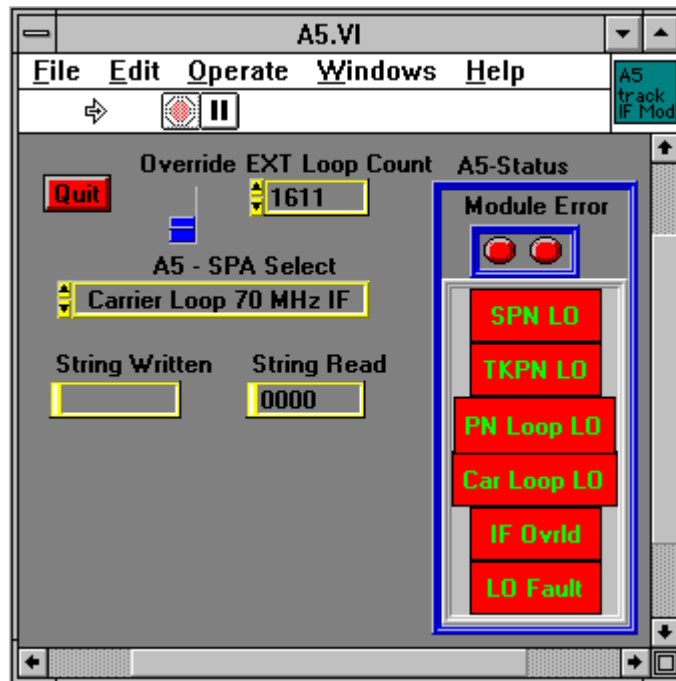


Figure 3-7E 370 MHz IF Tracking Screen

Table 3.7E

Control/Display	Description
Quit Override EXT Loop Count A5 SPA Select String Written String Read Module Error SPN LO TKPN LO PN Loop LO Car Loop LO IF Ovrl'd LO Fault	Click on this button to deactivate the screen and return to the previous active screen.

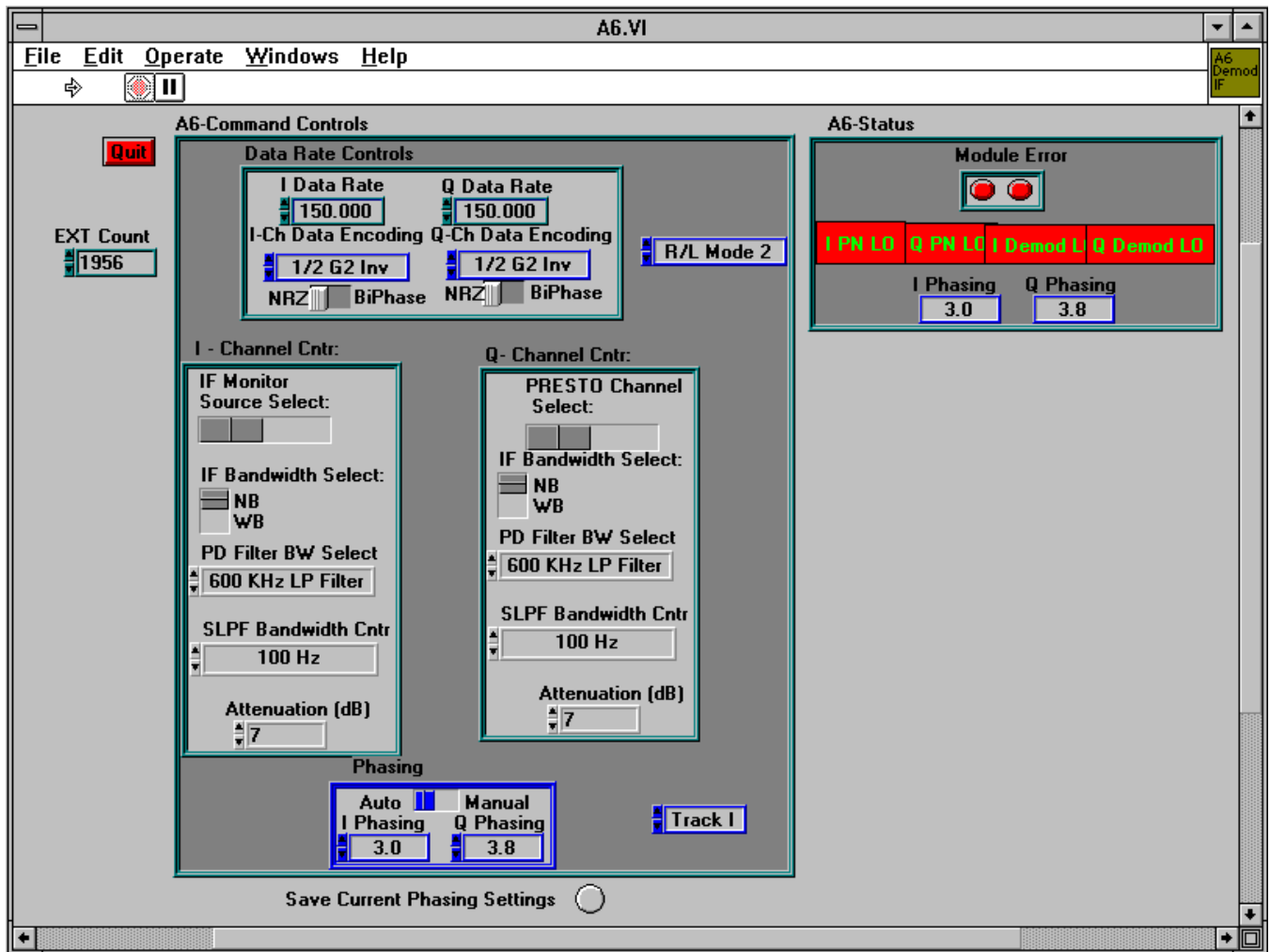


Figure 3.7F Data Demodulator Screen

Table 3.7F

Control/Display	Description
Quit EXT Count A6-Command Controls Mode Track Data Rate Controls I Data Rate I-Ch Data Encoding I-Ch Data Format Q Data Rate Q-Ch Data Encoding Q-Ch Data Format I-Channel Cntr: IF Monitor Source Select IF Bandwidth Select PD Filter BW Select SLPF Bandwidth Cntr Attenuation Q-Channel Cntr: IF Monitor Source Select IF Bandwidth Select PD Filter BW Select SLPF Bandwidth Cntr Attenuation Phasing Auto/Manual I Phasing Q Phasing A6-Status Module Error IPN LO Q PN LO I Demod LO Q Demod LO I Phasing Q Phasing	Click on this button to deactivate the screen and return to the previous active screen.

A7.VI

File Edit Operate Windows Help

AA7 DSP main

A7 Controls

Signal Type
R/L Mode 2

TDRSS Parameters
Agency: NASA
User Code (1-85): 1
I:Q Ratio: 1:1
I-PN: Enabled
Q-PN: Disabled
Track I: ☒
C/No Range: Medium
Test Source Freq: 0.000 KHz

Freq Controls
Center Freq (MHz): 2287.500000
Offset Freq (Hz): 0
Carrier Loop BW: On 1000 Hz
A Manual Acq Loop BW: On 1000 Hz
T Manual Trk Loop BW: On 1000 Hz
PN Reacq: ☒
Car Reacq: ☒
RESET DSP: ☒

AGC Ref
Low C/No: 0.3250
Med C/No: 0.1300
High C/No: 0.0300

Block Out

Block In
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
0000 0000 0000 0000

A7 Status

RX Status
Receiver State: Initialization
Carrier Phase Error (Deg):
PN Loop Lock: ☒
Carrier Loop Lock: ☒
Subcar Loop Lock: ☒
SC Phase Error (Deg):
RX Center: 2110.000000 MHz
RX Offset: -1775000000 Hz
RX Chip Rate: 0.000000 Mcps
Subcarrier Center: 0.000000 MHz
Subcarrier Offset: 0 Hz
Est. C/No: 36.4 dB-Hz
370 MHz Level: -48.5 dBm

Module Error
☒ ☒

DSP Elapsed Time
0.0

Test Source Freq
0.000000 MHz

Raw Values

Receiver NCO CW	0	PN Lock Measure	1.000
Carrier Loop NCO CW	0	PN Phase Error	1.0
PN Code NCO CW	0	Carrier Lock Measure	1.000
Subcarrier NCO CW	0	Carrier Phase Error	1.0
DCA CW	0	Subcar Lock Measure	1.000
Test Source NCO CW	0	Subcar Phase Error	1.0
I ² Value	1.0	Q ² Value	1.0

Adjust Gain Values
370 Level Cal Value: -48.5 dBm
RFD Gain: 52.50 dB

In: 0 Out: 0

Figure 3.7G Digital Signal Processor Screen

Table 3.7G

Control/Display	Description
Quit EXT Count Override AGC Adjust Gain Values 370 Level Cal Value RFD Gain In Out A7 Controls Signal Type PN Reacq Car Reacq RESET DSP Test Source Freq TDRSS Parameters Agency User Code (1-85) I:Q Ratio I-PN Q-PN Track C/No Range Freq Controls Center Freq (MHz) Offset Freq (Hz) Carrier Loop BW Manual Acq Loop BW Manual Trk Loop BW	Click on this button to deactivate the screen and return to the previous active screen.

Table 3.7G, Continued

Control/Display	Description
A7 Status Module Error DSP Elapsed Time Test Source Freq RX Status Receiver State RX Config Carrier Phase Error Track I PN Q PN PN Loop Lock Carrier Loop Lock Subcar Loop Lock Carrier Loop BW 370 MHz Level Est. C/No RX Center RX Offset RX Chip Rate Subcarrier Center Subcarrier Offset Raw Values Receiver NCO CW Carrier Loop NCO CW PN Code NCO CW Subcarrier NCO CW DCA CW Test Source NCO CW I ² Value PN Lock Measure PN Phase Error Carrier Lock Measure Carrier Phase Error Subcar Lock Measure Subcar Phase Error Q ² Value	

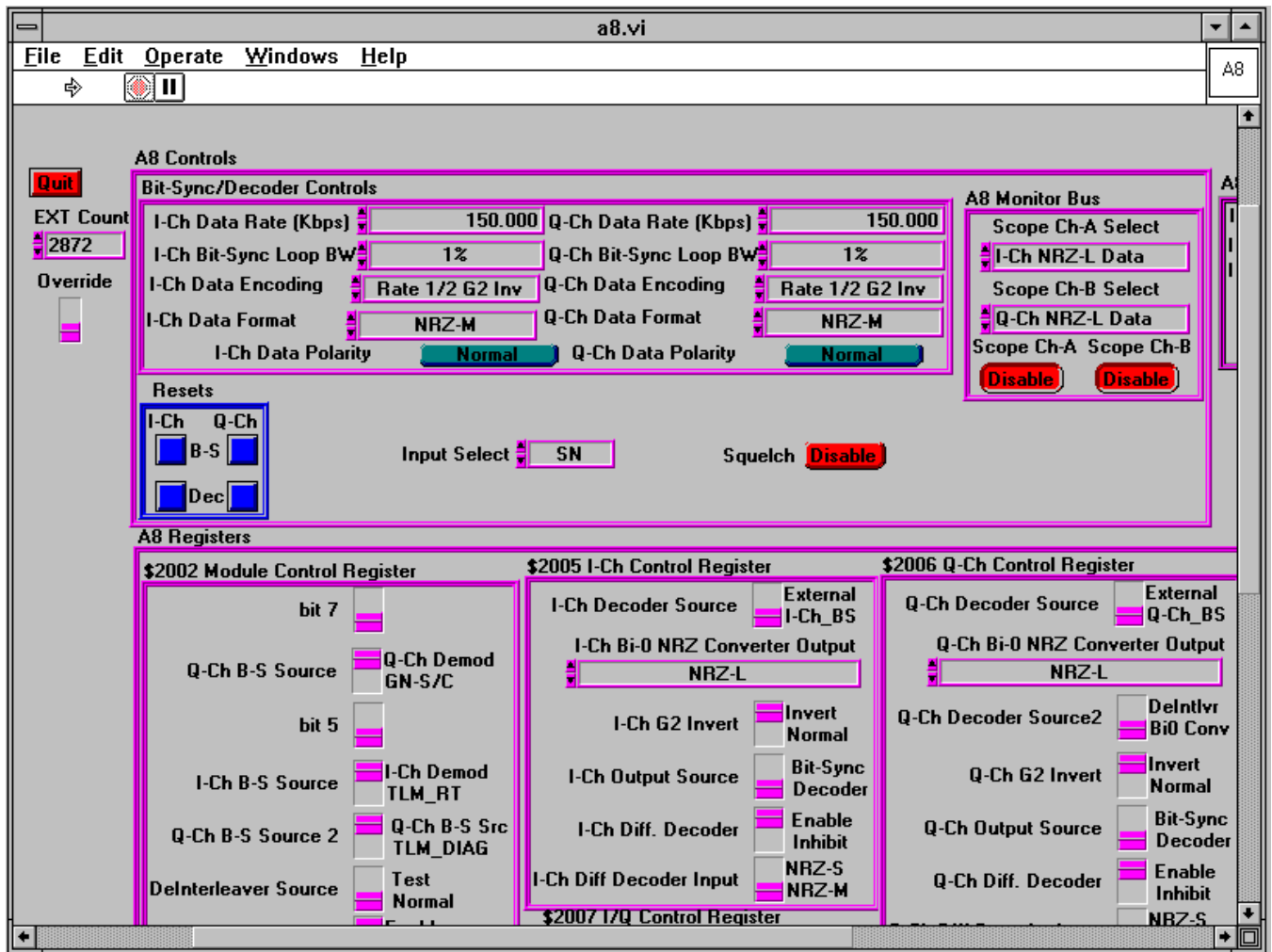


Figure 3.7H Bit Sync & Viterbi Decoder Screen

Table 3.7H

Control/Display	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.

A10.VI

File Edit Operate Windows Help

Quit

EXT Count
3171

Override

A10-Status

Module Error

A10 - Command Controls

Data Simulator Controls

I-Ch Data Rate (Kbps)	150.000	Q-Ch Data Rate (Kbps)	150.000
I-Ch Data Pattern	2 ¹¹ - 1	Q-Ch Data Pattern	2 ¹¹ - 1
I-Ch Data Sim Output	Data Simulator	Q-Ch Data Sim Output	Data Simulator
I-Ch Data Encoding	Rate 1/2 G2 Inv	Q-Ch Data Encoding	Rate 1/2 G2 Inv
I-Ch Data Format	NRZ-M	Q-Ch Data Format	NRZ-M

Transponder TLM Output Controls

I-Ch TLM Output	Off
Q-Ch TLM Output	Off

\$A001..2 A10 Monitor Bus

Scope Ch-A Sele
F/L User Comm
Scope Ch-B Sele
I-Ch Sim Dat
Scope Sync Sele
I-Ch Sim Data E
Scope Ch-A Disable
Scope Ch-B Disable

A10 Registers

\$A000 I-Ch Data Control Register

I-Ch G2	<input checked="" type="checkbox"/> Invert <input type="checkbox"/> Norm
Transmitter I-Ch Data Select	I-Ch Symbols
I-Ch DE	<input type="checkbox"/> Disable <input checked="" type="checkbox"/> Enable
I-Ch Bi0 Src	<input checked="" type="checkbox"/> Symbol <input type="checkbox"/> Sim Data
Transponder I-Ch Data Select	n/c

\$A003 Q-Ch Data Control Register

Q-Ch Bi0 Src	<input checked="" type="checkbox"/> Symbol <input type="checkbox"/> Sim Data
Q-Ch DE	<input type="checkbox"/> Disable <input checked="" type="checkbox"/> Enable
Q-Ch G2	<input checked="" type="checkbox"/> Invert <input type="checkbox"/> Norm
Q-Ch Enc Rate	<input checked="" type="checkbox"/> 1/3 <input type="checkbox"/> 1/2
Q-Ch TLM Output	<input checked="" type="checkbox"/> Enable <input type="checkbox"/> Disable
Transmitter Q-Ch Data Select	Q-Ch Symbols

\$A001 2 A10 Monitor Bus

Figure 3.7I Data Simulator Screen

Table 3.7I

Control/Display	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.

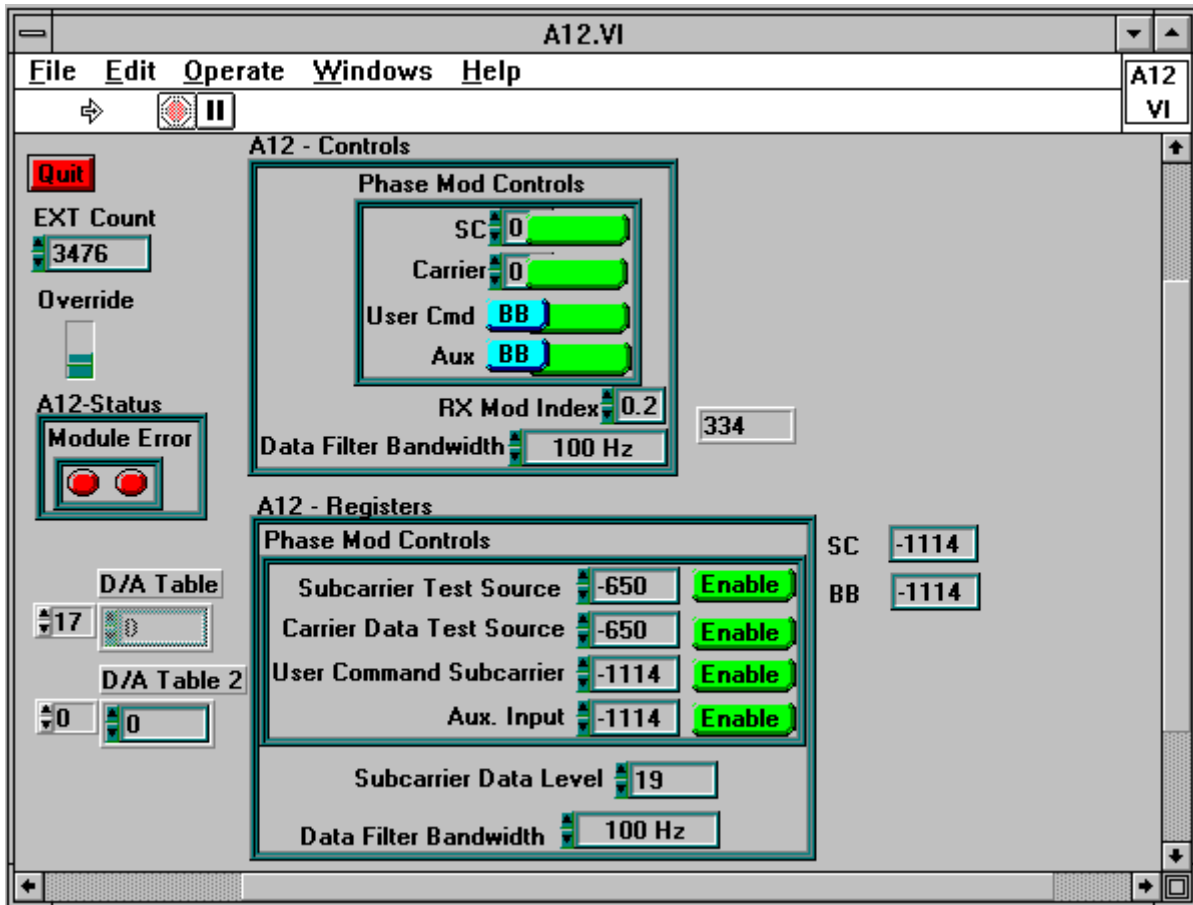


Figure 3.7J Ground Network Screen

Table 3.7J

Control/Display	Description
Quit EXT Count Override Module Error D/A Table D/A Table 2 SC BB A12-Controls RX Mod Index Data Filter Bandwidth Phase Mod Controls SC Carrier User Cmd Aux A12-Registers Subcarrier Data Level Data Filter Bandwidth Phase Mod Controls Subcarrier Test Source Carrier Data Test Source User Command Subcarrier Aux. Input	Click on this button to deactivate the screen and return to the previous active screen.

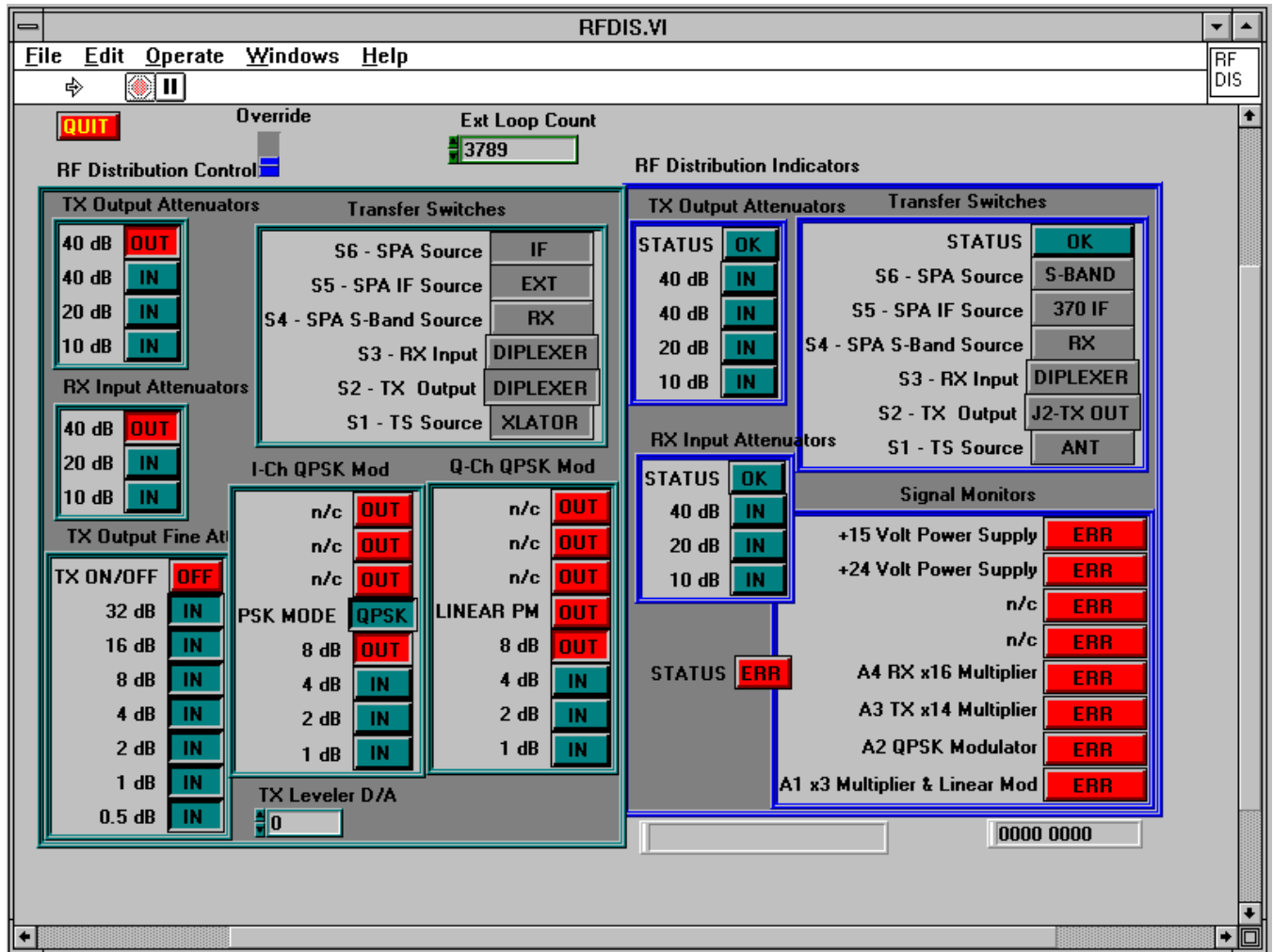


Figure 3.7K RF Distribution Unit Screen

Table 3.7K

Control/Display	Description
Quit Override Ext Loop Count RF Distribution Control TX Leveler D/A TX Output Attenuators 40 dB 40 dB 20 dB 10 dB RX Input Attenuators 40 dB 20 dB 10 dB TX Output Fine Attenuators 32 dB 16 dB 8 dB 4 dB 2 dB 1 dB 0.5 dB Transfer Switches S6-SPA Source S5-SPA IF Source S4-SPA S-Band Source S3-RX Input S2-TX Output S1-TS Source I-Ch QPSK Mod n/c PSK Mode 8 dB 4 dB 2 dB 1 dB Q-Ch QPSK Mod n/c LINEAR PM 8 dB 4 dB 2 dB 1 dB	Click on this button to deactivate the screen and return to the previous active screen.

Table 3.7K, Continued

Control/Display	Description
RF Distribution Indicators STATUS TX Output Attenuators STATUS 40 dB 40 dB 20 dB 10 dB RX Input Attenuators STATUS 40 dB 20 dB 10 dB Transfer Switches STATUS S6-SPA Source S5-SPA IF Source S4-SPA S-Band Source S3-RX Input S2-TX Output S1-TS Source Signal Monitors +15 Volt Power Supply +24 Volt Power Supply n/c RX x16 Multiplier Tx x14 Multiplier QPSK Modulator x3 Multiplier & Linear Mod	

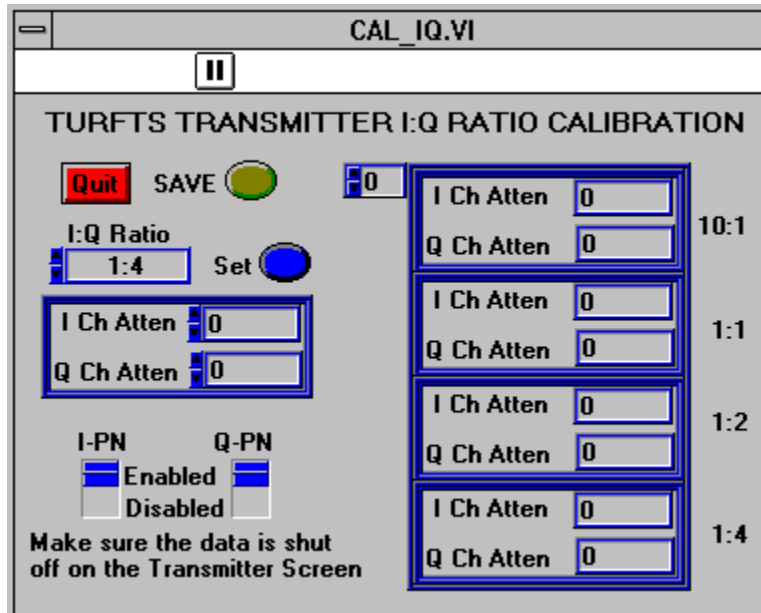


Figure 3.7L I and Q Channel Calibration Screen

Table 3.7L

Control/Display	Description
Quit	Click on this button to deactivate the screen and return to the previous active screen.
SAVE	Clicking on this will save current settings to a text file that is used by the main program.
I:Q Ratio	Selects one of four I/Q settings
Set	Sets in the new attenuator settings to be measured.
I Ch Atten	The user can enter from 0 to 15 dB of attenuation.
Q Ch Atten	The user can enter from 0 to 15 dB of attenuation.
I PN	The user can enable or disable the IPN code to aid in measuring carrier suppression.
Q PN	The user can enable or disable the QPN code to aid in measuring carrier suppression.
10:1	Displays current I and Q attenuator settings.
1:1	Displays current I and Q attenuator settings.
1:2	Displays current I and Q attenuator settings.
1:4	Displays current I and Q attenuator settings.

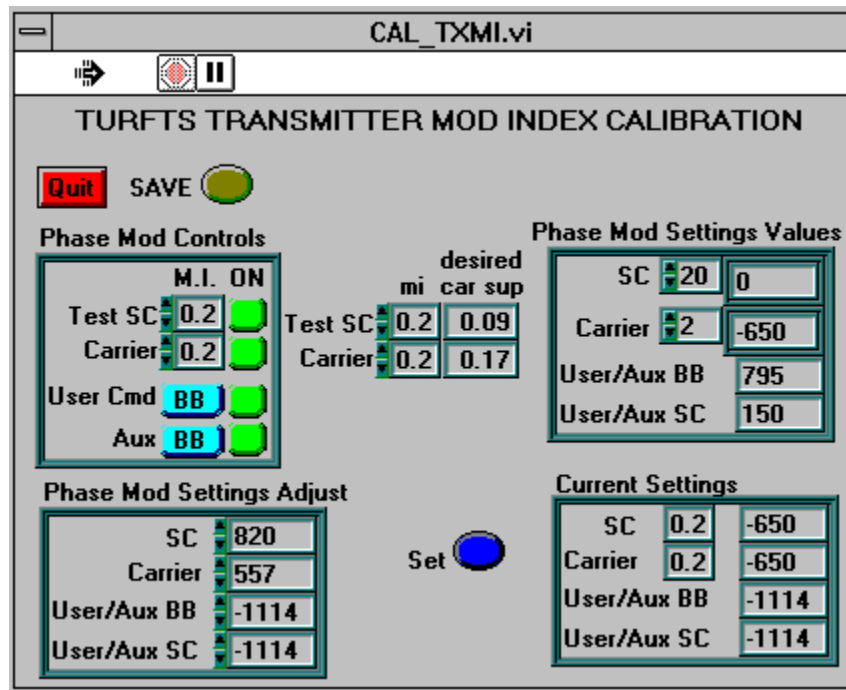


Figure 3.7M Modulation Index Calibration Screen

Table 3.7M

Control/Display	Description
Quit SAVE Set Test SC mi; car sup Carrier mi; car sup Phase Mod Controls Test SC Carrier User Cmd Aux Phase Mod Settings Adjust SC Carrier User/Aux BB User/Aux SC Phase Mod Settings Values SC Carrier User/Aux BB User/Aux SC Current Settings SC User/Aux BB User/Aux SC	Click on this button to deactivate the screen and return to the previous active screen.

3.2.8 FAULT MONITORS SCREEN

The Fault Monitors Screen provides the user with a display of all the fault isolation points throughout the test set. If the Fault Monitor button displays red then there is a detected fault within the test set and the user can further isolate the problem to a specific area of the test set. The screen is divided into four sections: Transmitter Status, Receiver Status, Module Status, and Reference Frequency Source. Refer to Figure 3.8 and Table 3.8.

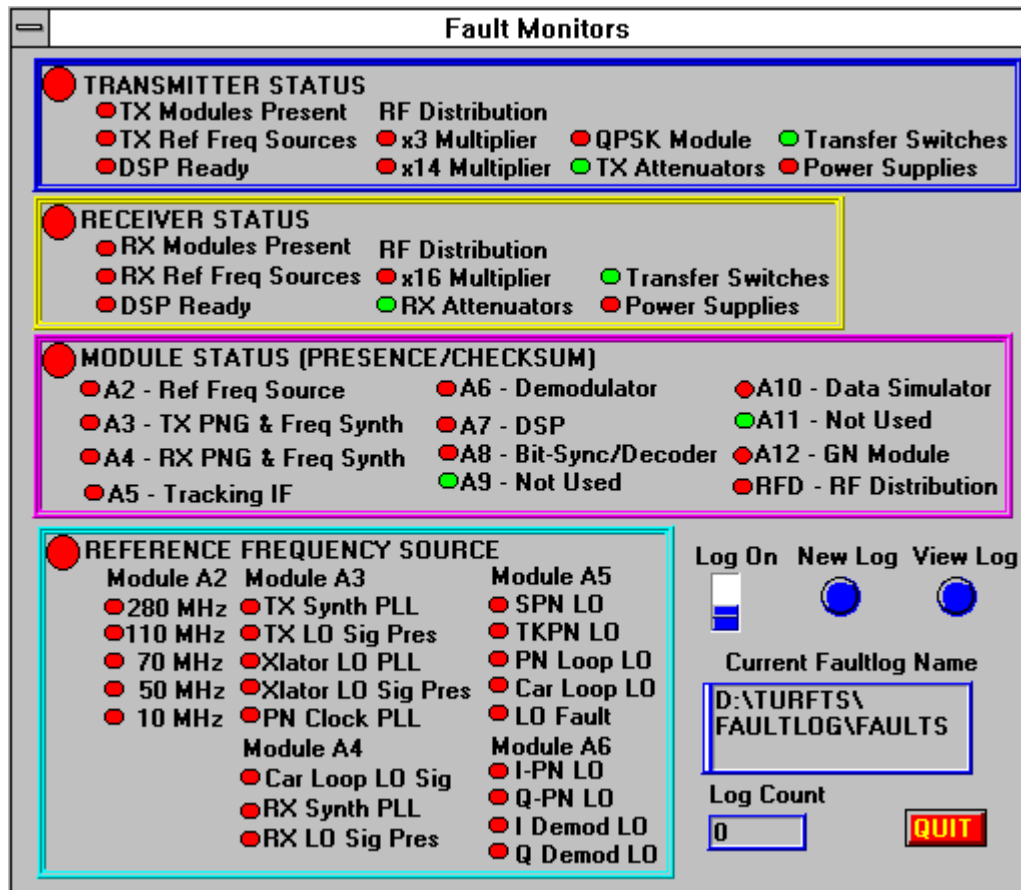


Figure 3.8 Fault Monitor Screen

Table 3.8

Fault	Description
TX Modules Present	Displays a fault if any of the transmitter related modules have detected a fault.
TX Ref Freq Sources	Displays a fault if any transmitter reference frequencies have indicated a fault.
DSP Ready	Displays a fault if the Digital Signal Processor is not running.
x3 Multiplier	Indicates the output from the x3 in the RFDU is missing or lower than -5 dBm.
x14 Multiplier	Indicates the x14 in the RFDU has dropped phase lock loop.
QPSK Module	Indicates the output from the QPSK modulator in the RFDU is missing or lower than +4 dBm.
TX Attenuators	Indicates the wrong command went to the transmitter coarse attenuator.
Transfer Switches	Displays a fault if any of the six transfer switches is not in the correct position.
Power Supplies	Indicates one of the RFDU power supplies (+15V or +24V) is not functioning.
RX Modules Present	Displays a fault if any of the receiver related modules have detected a fault.
RX Ref Freq Sources	Displays a fault if any receiver reference frequencies have indicated a fault.
DSP Ready	Displays a fault if the Digital Signal Processor is not running
x16 Multiplier	Indicates the x16 in the RFDU has dropped phase lock loop.
Rx Attenuators	Indicates the wrong command went to the receiver coarse attenuator.
Transfer Switches	Displays a fault if any of the six transfer switches is not in the correct position.
Power Supplies	Indicates one of the RFDU power supplies (+15V or +24V) is not functioning.
A2 - Ref Freq Source	Indicates the Signal Processing Unit module A2 is not responding.
A3 - TX PNG & Freq Synth	Indicates the Signal Processing Unit module A3 is not responding.
A4 - RX PNG & Freq Synth	Indicates the Signal Processing Unit module A4 is not responding.
A5 - Tracking IF	Indicates the Signal Processing Unit module A5 is not responding.
A6 - Demodulator	Indicates the Signal Processing Unit module A6 is not responding.
A7 - DSP	Indicates the Signal Processing Unit module A7 is not responding.
A8 - Bit-Sync/Decoder	Indicates the Signal Processing Unit module A8 is not responding.
A9 - Not Used	
A10 - Data Simulator	Indicates the Signal Processing Unit module A10 is not responding.
A11 - Not Used	
A12 - GN Module	Indicates the Signal Processing Unit module A12 is not responding.
RFD - RF Distribution	Indicates the RF Distribution Unit is not responding.

Table 3.8, Continued

Fault	Description
280 MHz	Indicates the 280 MHz reference from A2 is missing or below TBD dBm.
110 MHz	Indicates the 110 MHz reference from A2 is missing or below TBD dBm.
70 MHz	Indicates the 70 MHz reference from A2 is missing or below TBD dBm.
50 MHz	Indicates the 50 MHz reference from A2 is missing or below TBD dBm.
10 MHz	Indicates the 10 MHz reference from A2 is missing or below TBD dBm.
TX Synth PLL	Indicates whether the transmitter phase detector in the LO phase lock loop is locked.
TX LO Sig Pres	Indicates a fault when the transmitter LO is missing or below +6 dBm.
Xlator LO PLL	Indicates whether the translator phase detector in the LO phase lock loop is locked.
Xlator LO Sig Pres	Indicates a fault when the translator LO is missing or below +6 dBm.
PN Clock PLL	Indicates whether the PN clock phase detector in the LO phase lock loop is locked.
Car Loop LO Sig	Indicates a fault when the 300 MHz LO in the receiver synthesizer module A3 is missing or below -17 dBm at the LO output.
RX Synth PLL	Indicates whether the receiver phase detector in the LO phase lock loop is locked.
RX LO Sig Pres	Indicates a fault when the receiver LO is missing or below +6 dBm.
SPN LO	Indicates a fault when the SPN LO is missing or below TBD dBm after the input amplifier on the Receiver IF Module A5.
TKPN LO	Indicates a fault when the TKPN LO is missing or below TBD dBm after the input amplifier on the Receiver IF Module A5.
PN Loop LO	Indicates a fault when the PN LO (70 MHz ref 1) is missing or below TBD dBm prior to the PN demodulator on the Receiver IF Module A5.
Car Loop LO	Indicates a fault when the CAR LO (70 MHz ref 1) is missing or below TBD dBm prior to the Carrier demodulator on the Receiver IF Module A5.
LO Fault	
I-PN LO	Indicates a fault when the I-PN LO (300 MHz) is missing or below TBD dBm.
Q-PN LO	Indicates a fault when the Q-PN LO (300 MHz) is missing or below TBD dBm.
I Demod LO	Indicates a fault when the I CH LO (70 MHz ref 2) is missing or below TBD dBm prior to the baseband demodulator on the Demodulator Module A6.
Q Demod LO	Indicates a fault when the Q CH LO (70 MHz ref 2) is missing or below TBD dBm prior to the baseband demodulator on the Demodulator Module A6.
Log On	The user can activate this button if their is a need to have a record during long periods of unattended testing.
New Log	Generates a new log. The user can enter a new name or over write the existing name.
View Log	Allows the user to view the fault log real time without exiting the TURFTS program.
Log Count	Displays the quantity of additional errors recorded once the Log On switch has been activated. If the count displayed has not changed, no new errors have been recorded.
QUIT	Click on this button to deactivate the Fault Monitors screen and return to the previous active screen.

3.2.9 PREFS SCREEN

The Preferences Screen provides the user with a list of TURFTS unique features that may or may not be part of the test set. These features can be enabled or disabled from this screen. Refer to Figure 3.9 and Table 3.9.

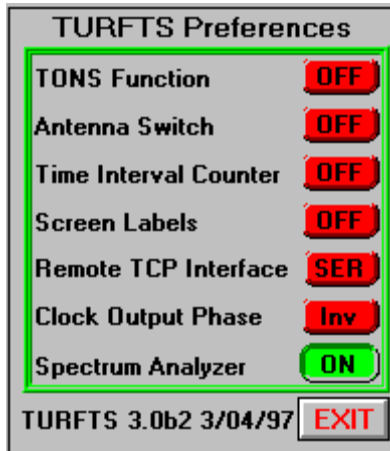


Figure 3.9 Preference Screen

Table 3.9

Feature	Description
TONS Function	If the user does not intend on performing TDRS Onboard Navigation testing this preference should OFF.
Antenna Switch	If the user does not have an Antenna Switch Box as part of the test set this preference should be OFF. Having it on could cause GPIB errors and allow the operation of the program.
Time Interval Counter	If the user does not have an HP53131A Time Interval Counter this preference should be OFF.
Screen Labels	Displays a label on the transmitter and receiver screens
Remote TCP Interface	Selects either Serial and TCP/IP remote control interface.
Clock Output Phase	Selects the bit sync's output clock phasing.
Spectrum Analyzer	If the user does not have an HP8563A Spectrum Analyzer this preference should be disabled.
EXIT	Exits screen and asks user to save new preference select or cancel.

3.3 OPERATING INSTRUCTIONS

The TURFTS can be configured to operate in the self test mode for TDRS or Ground Network configurations. The test set can also be configured to a Device Under Test (DUT). The following paragraphs will guide the user through the available modes of operation.

3.3.1 Turn On Procedures

The TURFTS requires a sequence of power on:

1. Turn rack power on
2. Turn computer system on
3. Turn on commercial test equipment
4. Turn on RF Distribution Unit (RFDU) from the rear of chassis
5. Turn on fan assembly under the Signal Processing Unit (SPU)
6. Turn on the SPU from the rear of chassis
7. When the computer network initializes enter the password. Double click on the TURFTS icon. The user will be asked to select a Fault Log Filename. Click on OK if the correct directory and filename is displayed. If the filename already exists the user will be asked to replace it. Click OK if you want to write over the selected fault file. The program will then load in the default STM2 (TDRS self test mode 2) configuration file. The test set is now ready for a user defined set up.

3.3.2 Self Test Set-ups

There are five basic self test modes the user can configure the test set. These modes are useful for verifying the operation of the test set with user defined parameters prior to connection to a DUT.

TDRS-Return Link Mode 1: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.10 to configure the Transmitter for R/L Mode 1. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.10

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 1	I-Ch Data Rate	User selected
Agency	NASA (Typical)	I-Ch Data Pattern	2 ¹¹ -1 (Typical)
User Code (1-85)	Transponder Assigned Code	I-Ch Data Sim Output	Data Simulator
I:Q Ratio	Transponder I:Q Ratio	I-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
I-PN	Enabled	I-Ch Data Format	User Selected (NRZ-M Typical)
Q-PN	Enabled	Q-Ch Data Rate	User selected
I-Ch TLM Output	Off	Q-Ch Data Pattern	2 ¹¹ -1 (Typical)
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Data Simulator
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	User Selected (NRZ-M Typical)
Frequency Offset	0 Hz	Desired Xpndr Input	+10 dBm
Sweep Mode	Off	Ext Attenuation	0
Rate (Hz/sec)	150	RF Output Select	Self Test
Range (Hz)	1,350	TX Output	On

Click on the Quit/Close button to exit the Transmitter Screen and return to the Main Screen. Click on the Receiver button to activate the Receiver Screen. Use Table 3.11 to configure the Receiver for R/L Mode 1. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.11

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 1	AGC	ON
Agency	NASA (Typical)	Acq Loop BW	Auto (Typical)
User Code (1-85)	Same as Transmitter Screen	Trk Loop BW	Auto (Typical)
I:Q Ratio	N/A- Future development	RT/Diag	Disable
I-PN	Enabled	Squelch	Disable
Q-PN	Enabled	I-Ch Data Rate	Same as Transmitter Screen
Auto/Manual Phasing	Auto (Typical)	I-Ch Bit-Sync Loop BW	1%
I and Q Phasing	Auto setting	I-Ch Data Encoding	Same as Transmitter Screen
Channel Tracking	Track I	I-Ch Data Format	Same as Transmitter Screen
C/No Range	Medium	I-Ch Data Polarity	Normal (Typical)
Bit-Sync Xtras	N/A	Q-Ch Data Rate	Same as Transmitter Screen
Frequency Select	Ind (Typical)	Q-Ch Bit-Sync Loop BW	1%
Center Frequency	Transponder Transmit C.F.	Q-Ch Data Encoding	Same as Transmitter Screen
Frequency Offset	0 Hz	Q-Ch Data Format	Same as Transmitter Screen
RX Attn	30	Q-Ch Data Polarity	Normal (Typical)

The test set should now be configured for R/L Mode 1 self test operation. The spectrum analyzer should be displaying the recovered carrier above the noise bandwidth in the 70 MHz carrier loop IF and the scope should be displaying the recovered I and Q demodulated data. Click on the Quit/Close button to exit the Receiver Screen and return to the Main Screen. Click on the Save button to save the set up for R/L Mode 1 self test. A typical filename would be STM1 (Self Test Mode 1).

TDRS-Return Link Mode 2: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.12 to configure the Transmitter for R/L Mode 2. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.12

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 2	I-Ch Data Rate	User selected
Agency	NASA (Typical)	I-Ch Data Pattern	2 ¹¹ -1 (Typical)
User Code (1-85)	Transponder Assigned Code	I-Ch Data Sim Output	Data Simulator
I:Q Ratio	Transponder I:Q Ratio	I-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
I-PN	Enabled	I-Ch Data Format	User Selected (NRZ-M Typical)
Q-PN	Enabled	Q-Ch Data Rate	User selected
I-Ch TLM Output	Off	Q-Ch Data Pattern	2 ¹¹ -1 (Typical)
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Data Simulator
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	User Selected (NRZ-M Typical)
Frequency Offset	0 Hz	Desired Xpndr Input	+10 dBm
Sweep Mode	Off	Ext Attenuation	0
Rate (Hz/sec)	150	RF Output Select	Self Test
Range (Hz)	1,350	TX Output	On

Click on the Quit/Close button to exit the Transmitter Screen and return to the Main Screen. Click on the Receiver button to activate the Receiver Screen. Use Table 3.13 to configure the Receiver for R/L Mode 2. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.13

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 2	AGC	ON
Agency	NASA (Typical)	Acq Loop BW	Auto (Typical)
User Code (1-85)	Same as Transmitter Screen	Trk Loop BW	Auto (Typical)
I:Q Ratio	N/A- Future development	RT/Diag	Disable
I-PN	Enabled	Squelch	Disable
Q-PN	Enabled	I-Ch Data Rate	Same as Transmitter Screen
Auto/Manual Phasing	Auto (Typical)	I-Ch Bit-Sync Loop BW	1%
I and Q Phasing	Auto setting	I-Ch Data Encoding	Same as Transmitter Screen
Channel Tracking	Track I	I-Ch Data Format	Same as Transmitter Screen
C/No Range	Medium	I-Ch Data Polarity	Normal (Typical)
Bit-Sync Xtras	N/A	Q-Ch Data Rate	Same as Transmitter Screen
Frequency Select	Ind (Typical)	Q-Ch Bit-Sync Loop BW	1%
Center Frequency	Transponder Transmit C.F.	Q-Ch Data Encoding	Same as Transmitter Screen
Frequency Offset	0 Hz	Q-Ch Data Format	Same as Transmitter Screen
RX Attn	30	Q-Ch Data Polarity	Normal (Typical)

The test set should now be configured for R/L Mode 2 self test operation. The spectrum analyzer should be displaying the recovered carrier above the noise bandwidth in the 70 MHz carrier loop IF and the scope should be displaying the recovered I and Q demodulated data. Click on the Quit/Close button to exit the Receiver Screen and return to the Main Screen. Click on the Save button to save the set up for R/L Mode 2 self test. A typical filename would be STM2 (Self Test Mode 2).

TDRS-Return Link Mode 3: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.14 to configure the Transmitter for R/L Mode 3. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.14

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 3	I-Ch Data Rate	User selected
Agency	NASA (Typical)	I-Ch Data Pattern	2 ¹¹ -1 (Typical)
User Code (1-85)	Transponder Assigned Code	I-Ch Data Sim Output	Data Simulator
I:Q Ratio	Transponder I:Q Ratio	I-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
I-PN	Enabled	I-Ch Data Format	User Selected (NRZ-M Typical)
Q-PN	Enabled	Q-Ch Data Rate	User selected
I-Ch TLM Output	Off	Q-Ch Data Pattern	2 ¹¹ -1 (Typical)
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Data Simulator
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	User Selected (NRZ-M Typical)
Frequency Offset	0 Hz	Desired Xpndr Input	+10 dBm
Sweep Mode	Off	Ext Attenuation	0
Rate (Hz/sec)	150	RF Output Select	Self Test
Range (Hz)	1,350	TX Output	On

Click on the Quit/Close button to exit the Transmitter Screen and return to the Main Screen. Click on the Receiver button to activate the Receiver Screen. Use Table 3.15 to configure the Receiver for R/L Mode 3. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.15

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode 3	AGC	ON
Agency	NASA (Typical)	Acq Loop BW	Auto (Typical)
User Code (1-85)	Same as Transmitter Screen	Trk Loop BW	Auto (Typical)
I:Q Ratio	N/A- Future development	RT/Diag	Disable
I-PN	Enabled	Squelch	Disable
Q-PN	Enabled	I-Ch Data Rate	Same as Transmitter Screen
Auto/Manual Phasing	Auto (Typical)	I-Ch Bit-Sync Loop BW	1%
I and Q Phasing	Auto setting	I-Ch Data Encoding	Same as Transmitter Screen
Channel Tracking	Track I	I-Ch Data Format	Same as Transmitter Screen
C/No Range	Medium	I-Ch Data Polarity	Normal (Typical)
Bit-Sync Xtras	N/A	Q-Ch Data Rate	Same as Transmitter Screen
Frequency Select	Ind (Typical)	Q-Ch Bit-Sync Loop BW	1%
Center Frequency	Transponder Transmit C.F.	Q-Ch Data Encoding	Same as Transmitter Screen
Frequency Offset	0 Hz	Q-Ch Data Format	Same as Transmitter Screen
RX Attn	30	Q-Ch Data Polarity	Normal (Typical)

The test set should now be configured for R/L Mode 3 self test operation. The spectrum analyzer should be displaying the recovered carrier above the noise bandwidth in the 70 MHz carrier loop IF and the scope should be displaying the recovered I and Q demodulated data. Click on the Quit/Close button to exit the Receiver Screen and return to the Main Screen. Click on the Save button to save the set up for R/L Mode 3 self test.

A typical filename would be STM3 (Self Test Mode 3).

TDRS-Forward Link Mode: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.16 to configure the Transmitter for F/L Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.16

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	F/L Mode	I-Ch Data Rate	User selected
Agency	NASA (Typical)	I-Ch Data Pattern	2 ¹¹ -1 (Typical)
User Code (1-85)	Transponder Assigned Code	I-Ch Data Sim Output	Data Simulator
I:Q Ratio	Transponder I:Q Ratio	I-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
I-PN	Enabled	I-Ch Data Format	User Selected (NRZ-M Typical)
Q-PN	Enabled	Q-Ch Data Rate	User selected
I-Ch TLM Output	Off	Q-Ch Data Pattern	2 ¹¹ -1 (Typical)
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Data Simulator
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	User Selected (Rate 1/2 G2 INV)
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	User Selected (NRZ-M Typical)
Frequency Offset	0 Hz	Desired Xpndr Input	+10 dBm
Sweep Mode	Off	Ext Attenuation	0
Rate (Hz/sec)	150	RF Output Select	Self Test
Range (Hz)	1,350	TX Output	On

Click on the Quit/Close button to exit the Transmitter Screen and return to the Main Screen. Click on the Receiver button to activate the Receiver Screen. Use Table 3.17 to configure the Receiver for F/L Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.17

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	F/L Mode	AGC	ON
Agency	NASA (Typical)	Acq Loop BW	Auto (Typical)
User Code (1-85)	Same as Transmitter Screen	Trk Loop BW	Auto (Typical)
I:Q Ratio	N/A- Future development	RT/Diag	Disable
I-PN	Enabled	Squelch	Disable
Q-PN	Enabled	I-Ch Data Rate	Same as Transmitter Screen
Auto/Manual Phasing	Auto (Typical)	I-Ch Bit-Sync Loop BW	1%
I and Q Phasing	Auto setting	I-Ch Data Encoding	Same as Transmitter Screen
Channel Tracking	Track I	I-Ch Data Format	Same as Transmitter Screen
C/No Range	Medium	I-Ch Data Polarity	Normal (Typical)
Bit-Sync Xtras	N/A	Q-Ch Data Rate	Same as Transmitter Screen
Frequency Select	Ind (Typical)	Q-Ch Bit-Sync Loop BW	1%
Center Frequency	Transponder Transmit C.F.	Q-Ch Data Encoding	Same as Transmitter Screen
Frequency Offset	0 Hz	Q-Ch Data Format	Same as Transmitter Screen
RX Attn	30	Q-Ch Data Polarity	Normal (Typical)

The test set should now be configured for R/L Mode 3 self test operation. The spectrum analyzer should be displaying the recovered carrier above the noise bandwidth in the 70 MHz carrier loop IF and the scope should be displaying the recovered I and Q demodulated data. Click on the Quit/Close button to exit the Receiver Screen and return to the Main Screen. Click on the Save button to save the set up for F/L Mode self test. A typical filename would be STFL (Self Test Forward Link Mode).

GN Mode: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.18 to configure the Transmitter for GN Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.18

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	GN	I-Ch Data Rate	User selected (PSK'd on Test SC)
Test SC Freq (KHz)	1024.000	I-Ch Data Pattern	2 ¹¹ -1 (Typical)
Test SC M.I. (Rad)	User Defined	I-Ch Data Sim Output	Data Simulator
Test SC On/Off	User Defined	I-Ch Data Encoding	User Selected
Carrier M.I. (Rad)	User Defined	I-Ch Data Format	User Selected
Carrier On/Off	User Defined	Q-Ch Data Rate	User selected (PM'd on Carrier)
I-Ch TLM Output	Off	Q-Ch Data Pattern	2 ¹¹ -1 (Typical)
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Data Simulator
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	User Selected
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	User Selected
Frequency Offset	0 Hz	Desired Xpndr Input	+10 dBm
Sweep Mode	Off	Ext Attenuation	0
Rate (Hz/sec)	20,000	RF Output Select	Self Test
Range (Hz)	120,000	TX Output	On

Click on the Quit/Close button to exit the Transmitter Screen and return to the Main Screen. Click on the Receiver button to activate the Receiver Screen. Use Table 3.19 to configure the Receiver for GN Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.19

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	GN	Trk Loop BW	Auto (Typical)
Subcarrier Freq (KHz)	1024.000	RT/Diag	Disable
Mod Index	N/A Future Development	Squelch	Disable
Auto/Manual Phasing	Auto (Typical)	I-Ch Data Rate	Carrier Data
I and Q Phasing	Auto setting	I-Ch Bit-Sync Loop BW	1%
Bit-Sync Xtras	N/A	I-Ch Data Encoding	
Frequency Select	Ind (Typical)	I-Ch Data Format	
Center Frequency	Transponder Transmit C.F.	I-Ch Data Polarity	Normal (Typical)
Frequency Offset	0 Hz	Q-Ch Data Rate	Subcarrier Data
RX Attn	30	Q-Ch Bit-Sync Loop BW	1%
AGC	ON	Q-Ch Data Encoding	
Acq Loop BW	Auto (Typical)	Q-Ch Data Format	
		Q-Ch Data Polarity	Normal (Typical)

The test set should now be configured for GN Mode self test operation. The spectrum analyzer should be displaying the recovered carrier above the noise bandwidth in the 70 MHz carrier loop IF and the scope should be displaying the recovered Carrier Baseband data and the Subcarrier. Click on the Quit/Close button to exit the Receiver Screen and return to the Main Screen. Click on the Save button to save the set up for GN Mode self

test. A typical filename would be STGN (Self Test GN Mode).

3.3.3 User Configurations to Device Under Test (DUT)

The following paragraphs describe how the user can configure the test set for testing a spacecraft or DUT.

TURFTS Transmitter configuration for TDRSS mode of operation: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.20 to configure the transmitter for TDRSS Forward Link Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.20

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	F/L Mode	I-Ch Data Rate	Not Used
Agency	NASA (Typical)	I-Ch Data Pattern	Not Used
User Code (1-85)	Transponder Assigned Code	I-Ch Data Sim Output	Ext. User Input (User Cmds)
I:Q Ratio	10:1 (Typical)	I-Ch Data Encoding	Not Used
I-PN	Enabled	I-Ch Data Format	Not Used
Q-PN	Enabled	Q-Ch Data Rate	Not Used
I-Ch TLM Output	Off	Q-Ch Data Pattern	Not Used
Q-Ch TLM Output	Off	Q-Ch Data Sim Output	Not Used
Frequency Select	Indep of RX (Typical)	Q-Ch Data Encoding	Not Used
Center Frequency	Transponder Receive C.F.	Q-Ch Data Format	Not Used
Frequency Offset	0 Hz	Desired Xpndr Input	-110 to -140 dBm typically
Sweep Mode	Off	Ext Attenuation	User supplied
Rate (Hz/sec)	150	RF Output Select	Diplexed Output
Range (Hz)	1,350	TX Output	Off

When the user is ready to transmit the RF signal to the DUT select TX Output On and click on the SEND button.

TURFTS Receiver configuration for TDRSS mode of operation: From the main menu click on the Receiver button to activate the Receiver screen. Use Table 3.21 to configure the receiver for TDRSS Return Link Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.21

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	R/L Mode (1, 2, or 3)	AGC	ON
Agency	NASA (Typical)	Acq Loop BW	Auto (Typical)
User Code (1-85)	Same as Transmitter Screen	Trk Loop BW	Auto (Typical)
I:Q Ratio	N/A- Future development	RT/Diag	Disable
I-PN	Enabled	Squelch	Disable
Q-PN	Enabled	I-Ch Data Rate	User Defined
Auto/Manual Phasing	Auto (Typical)	I-Ch Bit-Sync Loop BW	1%
I and Q Phasing	Auto setting	I-Ch Data Encoding	User Defined
Channel Tracking	Track I (Typical)	I-Ch Data Format	User Defined
C/No Range	Determined by received signal	I-Ch Data Polarity	Normal (Typical)
Bit-Sync Xtras	N/A	Q-Ch Data Rate	User Defined
Frequency Select	Ind (Typical)	Q-Ch Bit-Sync Loop BW	1%
Center Frequency	Transponder Transmit C.F.	Q-Ch Data Encoding	User Defined
Frequency Offset	0 Hz	Q-Ch Data Format	User Defined
RX Attn	Determined by received signal	Q-Ch Data Polarity	Normal (Typical)

Depending on how the DUT is configured will determine what Mode is selected for the test set receiver. Once the test set receiver has acquired and is tracking the DUT's signal the user may have to adjust the I and Q phasing to optimize the recovered telemetry. Verify the Demodulator I and Demodulator Q channels are being displayed on the scope by clicking on the Signal Monitors Button on the MAIN Screen. On the RECEIVER Screen select Manual Phasing. Remember to click on the SEND button to activate any changes that have been made. While monitoring the Demodulator I Channel Data adjust the phase voltage up or down by click and holding on the spinner next to the I Phasing display. Do this until the peak to peak amplitude is maximized. Repeat for the Demodulator Q Channel Data. When completed go back to the MAIN Screen and click on the Inside TURFTS Button. Click on the A6 DEMOD IF Button. At the bottom of the screen is the 'Save Current Phasing Settings' button. Click on the button and Quit the screen. Quit the Inside TURFTS screen. On the RECEIVER Screen select Auto Phasing. The values that were set in under the manual mode should now be the values in the auto mode and should not have to be readjusted for the data rate values currently being used.

TURFTS Transmitter configuration for GN mode of operation: From the main menu click on the Transmitter button to activate the Transmitter screen. Use Table 3.22 to configure the transmitter for GN Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.22

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	GN	Range (Hz)	120,000
Test SC Freq (KHz)	N/A	I-Ch Data Rate	Not Used
Test SC M.I. (Rad)	N/A	I-Ch Data Pattern	Not Used
Test SC On/Off	Off	I-Ch Data Sim Output	Off
Carrier M.I. (Rad)	N/A	I-Ch Data Encoding	Not Used
Carrier On/Off	Off	I-Ch Data Format	Not Used
User Cmd Type	SC (GN Cmds)	Q-Ch Data Rate	Not Used
User Cmd On/Off	Off	Q-Ch Data Pattern	Not Used
Aux	Off	Q-Ch Data Sim Output	Off
I-Ch TLM Output	Off	Q-Ch Data Encoding	Not Used
Q-Ch TLM Output	Off	Q-Ch Data Format	Not Used
Frequency Select	Indep of RX (Typical)	Desired Xpndr Input	-90 to -50 typical
Center Frequency	Transponder Receive C.F.	Ext Attenuation	User Supplied
Frequency Offset	0 Hz	RF Output Select	Diplexed
Sweep Mode	Off	TX Output	Off
Rate (Hz/sec)	20,000		

When the user is ready to transmit the RF signal to the DUT select TX Output On and click on the SEND button. Once the DUT has acquired the signal the User Cmd modulation can be turned on.

TURFTS Receiver configuration for GN mode of operation: From the main menu click on the Receiver button to activate the Receiver screen. Use Table 3.23 to configure the receiver for GN Mode. Click on the SEND button after all entries and settings have been entered. If the box under the SEND button is yellow then there are still commands in the Queue that haven't been sent.

Table 3.23

Control or Parameter	Setting or Input	Control or Parameter	Setting or Input
Mode	GN	Trk Loop BW	Auto (Typical)
Subcarrier Freq (KHz)	1024.000	RT/Diag	Disable
Mod Index	N/A Future Development	Squelch	Disable
Auto/Manual Phasing	Auto (Typical)	I-Ch Data Rate	Carrier Data
I and Q Phasing	Auto setting	I-Ch Bit-Sync Loop BW	1%
Bit-Sync Xtras	N/A	I-Ch Data Encoding	
Frequency Select	Ind (Typical)	I-Ch Data Format	
Center Frequency	Transponder Transmit C.F.	I-Ch Data Polarity	Normal (Typical)
Frequency Offset	0 Hz	Q-Ch Data Rate	Subcarrier Data
RX Attn	Depends on signal level	Q-Ch Bit-Sync Loop BW	1%
AGC	ON	Q-Ch Data Encoding	
Acq Loop BW	Auto (Typical)	Q-Ch Data Format	
		Q-Ch Data Polarity	Normal (Typical)